THE RAILWAY REVIEW

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EXPORTATION OF ENGLISH RAILS.—Engineering notes with satisfaction that there has been a substantial increase in the exports of railway iron from the United Kingdom in the first three months of this year. The total shipments for the quarter ending March 31 were 157,469 tons, this total being made up as follows: Rails, 125,793 tons; chairs and sleepers, 16,896 tons; and miscellaneous, 14,780 tons. The corresponding shipments in the corresponding period of 1894 were 87,082 tons, this total being made up as follows: Rails, 74,199 tons; chairs and sleepers, 5,950 tons; and miscellaneous, 6,933 tons. In the first quarter of this year 64,700 tons of rails were exported to British India, 23,201 tons to the Argentine Republic, and 16,797 tons to Australasia. The corresponding deliveries in the corresponding period of 1895 were: British India, 27,199 tons; the Argentine Republic, 924 tons; and Australasia, 2,545 tons. Japan only took 4,593 tons of British rails this year, as compared with 72,562 tons in the corresponding period of 1895. The exports to the United States were 8,396 tons and 3,450 tons respectively.

PAPER SAILS.—It is claimed that paper sails are meeting with considerable favor. They are considerably cheaper than canvas sails, and owing to a special treatment are made as soft, flexible and untearable as the original article. To the paper pulp is added fat, a solution of alkali silicate, glue, alum and potassium dichromate. From this by means of a paper making machine, a fairly thick paper is produced. Two strips of this are pasted together, and by passing under considerable pressure through rollers a very thin soft sheet of paper is formed. It is then passed through a weak solution of sulphuric acid which has the effect of converting the upper surface into a species of parchment. Washing with a solution of soda, drying and glazing follow. Care is taken to leave the edges free when the strips of paper are fastened together so that other strips may be added at the sides, thus forming a sufficient breadth of sails. To fasten the strips together a paste is used which contains the same ingredients as those added to the paper pulp, while by inserting cords of ribbon on the sides the edging of the sail is formed. There are few articles which offer a greater field for ingenuity than that of paper. One of the most singular inventions is a stove made from paper. A recent suggestion is to use the waste dyewood chips as a paper filling.

LUBRICATION OF RAILS ON CURVES.—The rails on the sharpest curves of the New York Elevated Railroad are lubricated with plumbago grease. On the Halberstadt & Blankenburg Railway a similar plan has been in use since 1886, the lubricant being graphite and water. The results are stated to be very favorable, there being a great diminution of curve resistance. Previous to the adoption of this plan it had been requisite to line up tires every four or five months, but the wear is now less than on the level and straight portions of the line. The method is stated to have proved specially valuable on an Abt rack road, where it was not possible to ease the gage much on a curve without danger to the proper working of the pinion. The cost is small, eleven hundred weight of graphite being used in one year for 15 miles of curve.

GOVERNMENT OWNERSHIP OF RAILROADS.—Referring to the proposition of populists that railroads and telegraphs should be owned and operated by the general government, Judge Reagan railroad commissioner shows that the capitalization of the railways and of the principal telegraph and telephone companies is about $11,524.000,000. Assuming that the government might secure them for $10,000,000,000 he points out that the annual interest on this sum would $500,000,000 which would have to be raised by an enormous addition to the present taxation. Moreover, to manage these vast properties there would be a total of 1,250,000 federal appointments to make, which Judge Reagan says would be enough to completely dwarf the state governments and revolutionize the government of the United States as established by the constitution.

FLAX STRAW AS FUEL.—Writing concerning the operation of an electric plant at Watertown, S. D. The manager notes that being so far from the coal fields of Iowa and Illinois, results in transportation charges being so great as to prohibit the use of coal in this business with profit. Soft coal will cost from $3.50 to $6.50 per ton on cars here for the various qualities, from Iowa slack to the high grade eastern coals; and wood ranges from $3 per cord for soft wood to $4 for hard on cars. We can buy flax straw in abundance delivered at the plant for $1 per ton, and consider that two tons of straw is equivalent to a ton of the best coal. We have no special arrangement for using the straw. The same furnace and boiler are in service, as when burning any other fuel, only that we have constructed sheet iron chutes to the furnace doors with flaring approaches. By keeping the chutes full of straw and gradually working it into the furnace as consumed, we avoid the necessity of constantly opening and closing the furnace doors. The straw is delivered to us loose and burned in the same condition. It, of course, requires pretty close attention, yet, after all, does not burn away as rapidly as one would suppose. The fiber in the straw makes an intense heat.

TRAFFIC VIA THE "SOO" CANAL.—Comparative statement of commerce east and west bound through St. Mary's Falls canal, Michigan, for month of April, 1896.

EAST BOUND.

Items.	Designation.	U. S. Canal	Can. Canal	Total.
Copper	Net tons	3,808		3,808
Grain	Bushels	577,000		577,000
Building stone	Net tons			
Flour	Barrels	269,000	Not open	269,000
Iron ore	Net tons	79,316	to	79,316
Iron, pig	Net tons		navigation	
Lumber	M. ft. B. M.	504		504
Silver ore	Net tons			
Wheat	Bushels	2,092,250		2,092,250
Unclass'd frt	Net tons	518		518
Passengers	Number	22		22

WEST BOUND.

Items.	Designation.	U. S. Canal	Can. Canal	Total.
Coal (hard)	Net tons	2,620		2,620
Coal (soft)	Net tons	80,044		80,044
Flour	Barrels	12	Not open	12
Grain	Bushels	1,109	to	1,109
Manuf'd iron	Net tons	500	navigation	500
Salt	Barrels	11,520		11,520
Unclass'd frt	Net tons	9,082		9,082
Passengers	Number	41		41

East bound freight, net tons		185,178
West bound freight, net tons		93,996
Total		279,174
Total craft—United States	426	
Total craft—Canadian	—	
		426
Total registered tonnage—United States	458,047	
Total registered tonnage—Canadian	—	
		458,047

FIGURING BOILER STRENGTH.—Whenever the United States Government sends an engineer to figure the strain to which any boiler may be subjected while at work, the inspector uses a formula much different from that employed by the insurance inspectors. The government makes no account of riveted seams; the insurance inspector allows from 56 to 70 or 84 per cent, accordingly as a seam is single or double riveted or is fastened with a strap joint. Apparently the government inspection allows a greater steam pressure per square inch than does the insurance inspector, and in some cases where I have carefully figured the riveted seams, I have found that government inspections allow boilers to run with a factor of safety somewhat less than 4 per cent. This would not be allowed by any reputable boiler insurance company. The consideration of this matter demonstrates that in figuring the strength of any steam boiler it will not do to take 56 per cent of the shell for the strength of a single riveted seam, without figuring the strength of that seam. A properly devised seam will give more than 56 per cent; that figure is a fair average, as single riveted seams go, but in order to be exact, the pitch and diameter of the rivets must be obtained, and with the thickness of plate used in shell, the percentage of plate strength left between the rivet holes, can be very exactly determined. In this and only by this way can the actual safe working strain of any boiler be ascertained.—Tradesman.

AMERICAN MANUFACTURERS IN JAPAN.—The American Minister says that until recently, the difference between the cost of production in the United States and in England and other European countries has been so much in favor of the latter as to practically exclude the American manufacturer from competing in Japan. This difference appears to be rapidly disappearing, however, and there seems to be a fair prospect of some articles of American manufacture superseding the English or European make, particularly so in the case of tools and machinery of all kinds. This fact is owing, perhaps, more to the superior excellence of the American article in finish and in adaptability to its use than to its cheapness. American locomotives are growing in favor, and are beginning to find a market. One disadvantage they have to encounter, however, is that the railway repair shops are furnished with tools and parts for the repair of English locomotives and the workmen employed are familiar with those engines only. The American manufacturer being later in the field, is obliged not only to supply an equally cheap and serviceable article, but has also to overcome the disposition of the Japanese to continue the use of that which has already proved satisfactory and with which they are familiar. In my opinion one of the greatest advantages which the English and European manufacturers have over the American is the thoroughness of their methods of business. The former carefully study the wants and habits of the people in Japan and send out goods to meet those wants and habits, whereas our people seem disposed to educate the Japanese to our way of doing things, rather than to accept the conditions that exist and to supply what those conditions call for. The greatest competitor that not only American, but European manufacturers as well, have to fear in Japan is the growth of home manufacturing industries here. With an almost unlimited supply of cheap, skilled labor, and abundance of coal, and magnificent water power throughout the country, there is every indication that, in the near future, the manufacturing interests of Japan will increase enormously. Inquiries are constantly being received from America and Europe in regard to the feasibility of starting manufacturies of almost every kind with foreign capital and management. Existing treaties at present close Japan to foreign enterprise of this kind, but when the new treaties come into operation, there will be nothing to prevent American and European capitalists from availing themselves to the exceptional advantages that Japan will offer in almost every line of manufacture.

COVERING SAND BALLAST WITH BROKEN STONE.—To prevent dust has been successfully tried on the Orleans Railway, of France. For 214 miles this road is ballasted with fine sand, which envelops all express trains in a thick cloud. Stone is too scarce and costly to be used for ballast, instead of the sand, and an attempt to promote the growth of a species of grass over the track failed because in repairs the vegetable mold was soon mixed with sand. In 1888, it was decided to cover the sand with a 2½ in. bed of stone broken to pass through a 2½ in. ring. The excess sand was removed and the stone carefully spread and packed. In case of repairs a special steel fork is used to remove the stone from the surface and to put it back again. While the theoretic depth of the stone is 2½ in., its actual depth is really greater. The roadbed presents the appearance of being ballasted with broken stone; the sand is well covered and the nuisance from dust has been abated. The cost is said to be only one-fourth of that of all stone ballast in the valley of the Loire. The company also reports an unknown but large saving in the maintenance of rolling stock, due to the supression of dust. The cost varied from $484 to $774 per mile of double track, according to the first cost of the stone. This practice has been in use in India for many years.

EFFECT OF VIBRATION ON CAST IRON.—Outerbridge's dictum that cast iron, instead of being weakened or made brittle by vibration, is actually toughened and strengthened by this treatment, is stated in the following emphatic terms: "The result of about a thousand tests of bars of cast iron of all grades, from the softest foundry mixtures to the strongest car wheel metal, enables me to state with confidence that, within certain limits, cast iron is materially strengthened by subjection to shocks or repeated blows." The scientific and practical value of this discovery, for such it is, is very great, and is likely to affect the use of cast iron materially by relieving this metal of some of the distrust with which it is now viewed, and justly so, on account of the uncertainty of whether the shrinkage stresses will cause failure or not.—Engineering Mechanics.

A BLACKSMITH'S HANDY TOOL. — The tools and operations affected by smiths vary considerably in different portions of the country. A great many craftsmen of this trade never touch a hammer to the iron they are working. This seems a rather paradoxical statement, says Tradesman, but it is true. The helper does the work with a sledge, the smith guides the blows of the helper by means of various dies or forming tools. Perhaps the most important of these guiding tools is a flatter. It has the appearance of a hammer with an "aggravated" face, and is placed upon the work where the blow is desired to take effect, the helper striking with a sledge hammer upon the upper end of the flatter. A surface is obtained by the use of this tool which cannot be approached by direct blows of any hammer. It is singular that the smiths in one part of the country all use flatters of different shapes and sections, while in other sections of the country the tool is comparatively unknown. Tool makers in some locations use the flatter very little, but they could profitably take lessons in the art of using this instrument. Tool forging could be much better done, and the quality of the work considerably improved by its use. A good flatter should have a face two and one-half inches square, while the weld upon which the sledge strikes is about one and one-half inches. The thickness or depth of the flatter should be just enough to contain the eye from which the handle is applied, but a much better form of flatter dispenses with the eye, but is grooved around the outside, and a piece of iron twisted into the groove forms the supporting handle by which the smith guides its action. A flatter with an eye is very apt to split before it is otherwise worn out. The heavy use of the sledge destroys the metal, which fails first at the point between the eye and edge of the tool. When the ontside groove is used the metal is distributed to better resist the blows of the hammer and the tool lasts a long time without repairs.

RAPID DRILLING.—Electric drills have ceased to be a novelty, but certain progressive electrical engineers are not content with what has been accomplished in this inviting field. The ordinary brace and ratchet drill is relegated to the small shop. In English shipyards the electric motor is suspended by rope and pulley, which has a counterweight that admits of movement up and down by the workmen. By easily controlled mechanism the motor is steadied, and the drill can be worked 200 to 300 revolutions, but 70 to 100 is the average. The most ingenious device for driving drilling tools bores a series of holes one after another. In the electric drilling motor, as developed in some yards, each of its three legs is now an independent magnet, having a positive and negative pole. The face of each leg has three concentric spaces. The inner circle composes the negative pole, the outer ring the positive pole, a concentric portion between the two being filled with insulating material. Thus a perfectly steady tripod is afforded, and there is no danger of the drill breaking by its cutting unevenly through the plate. All these processes are as yet practically in their infancy, says Engineering Mechanics but it would seem as though the electric drill had a most important future. The sys-

tem might be extended, with the aid of the tripod electro magnetic contact, to slotting and planing, and we have little doubt that this will yet be accomplished. Messrs. Siemens have constructed portable electric motors, running at various speeds from 900 to 1200 revolutions per minute; these motors being connected up to long flexible cables, associated with a powerful current, form a dynamo, and being capable of rapid application to a vertical drill, which can be worked in any position within the radius provided by the length of the cables, and moved about from spot to spot as required.

UNIFORMITY IN STOREHOUSE STOCK.

In a paper recently read before the Northwest Railway Club by Mr. S. F. Forbes general storekeeper of the Great Northern Railway some excellent sugges tions are made in regard to the adoption of uniform material on railways from which the following paragraphs are taken.

The largest general stock of material required to be kept on hand is that for locomotive repairs. There are certain parts about all locomotives, regardless of their class, which are common to all. These parts should, to as great an extent as it is a mechanical possibility, be uniform in material and design, so that a repair part kept on hand for one is also applicable to all. That this is not so, and possibly may not be so for many years to come, is true. The difference in the same parts of different classes of locomotives is as varied on most roads as the variation in the classes; and to just such an extent is the expense incident to their maintenance increased.

Headlights on locomotives are all very much alike, but in detail they are more or less different. The reflectors and founts of some are deeper than others, the cases narrower or wider, the headlight reflector board not always the same. At points where workmen are not located that can repair these parts when defective, a fount with reflector, burner and board, complete, must be carried in stock. Its utility is very much abridged if there is a variety of headlights of different dimensions upon the locomotives, for several of which it is useless; and on an occasion demanding it, if needed for one of these engines, either the engine must be delayed until a proper reflector can be obtained, or considerable shifting must be done to keep the engine going until one which fits it is received.

The injector throttles on some engines have a connection threaded 10 threads to one inch, others 12 threads, and others again 14 threads, requiring that one of each of these be kept in stock where the engines are located. They also are different in their shape and design.

Injector checks also vary in the boiler fit. Whistles have a variety of ways of being connected. Cylinder cocks are made to fit into their places in the cylinder which may be threaded 6, 8 or 10 threads to one inch. Pilot castings and tender draft castings on different classes of engines are often of different design or are cored so that the bolt holes on one engine do not coincide with both holes on another.

Engines of various makes, but equal capacity are usually provided each with something unique in the way of chafing castings between engine and tender. The rocker grates of one class of locomotives seldom work in the grate bar of another of almost similar design, sometimes only an excess of half an inch in length preventing a fit.

Cylinder heads and castings are necessary for each individual class of engine, and usually different in each, even though the cylinders may be of equal diameter, and sometimes even engines of the same class and make have more studs in the cylinders of one engine than in those of another. Set screws are a varied product. Eccentric straps of the same throw are generally as different in pattern as the classes of engines.

In a railroad pattern record I remember to have seen the pattern number of a truck celler which had been made to fit the builder's truck box. The truck boxes of that class of engine have since been changed to a standard pattern now in use by the road, but during the period of its use, and until the change was made, I presume the celler figured in the stores where that class of engine was running. It cost some money to make the unnecessary pattern. It cost a double outlay in stock to keep two cellers where only one need otherwise have been kept; and I have no doubt that eventually when the builder's boxes had all worn out or been discarded, some of the new cellers that had been bought and paid for were discarded and sold as scrap. Fire box doors differ on different engines, as also do the door liners.

These are only a few of the prominent cases of lack of uniformity which I believe can be found on most railroads, and a careful survey of the material kept in stock, both at the general store and at divisional points, is direct evidence of the cost that this variety in design is entailing on the companies.

Then, again, there is the variation in detail which sometimes takes place in an unauthorized change at some division shop. As this is unknown at headquarters, and consequently unrecorded, it is likely sooner or later to lead to a serious delay to the locomotive while wrong material and explanations are traveling back and forth; or some makeshift must be restored to which is simply an additional expenditure of labor without benefit.

Cars and coaches are also subject to this variety in design, but late years have brought a degree of uniformity in them that is becoming more marked each year. The necessity for this, arising from the migratory habits which cars possess, and their inability to stray afield and get safely home again without a certain degree of uniformity which enables them to fraternize with the "foreigners" in their peregrinations.

How much the adoption of the U. S. standard thread has simplified so simple and yet so important a feature in all mechanical work! Could there not with economy be adopted a standard of diameters and threads for certain parts of locomotive equipment, i. e., establish a certain diameter and thread for oil cups, injector throttles, checks, blower cocks, gage cocks, set stews, studs. etc., all worked out on mechanical principles, not at all on account of any possible necessity of interchange belween roads, but that in obtaining new equipment and in repairing old equipment, wherever possible, a set standard known of all men might be adhered to.

The more nearly the same parts on different equipment can be made uniform, the cheaper can shop work be done through lessening the necessity for frequent changes in machines while parts are being machined; the more systematically also can the pits be arranged for taking down and setting up these parts, and from familiarity with this regularity in design, the workmen would naturally become more expert. Also a more economical system of handling the parts about the shops will be possible.

It is probably apparent to most shop men that this feature of the work is often extravagant where all else may be labor saving to a degree. The continued running from one shop to another by expensive workmen, the carrying pieces of work or tools around awkward places filled up with wheels, or cylinders, or driving wheels, the idle time of helpers while this is being done, then inconvenient location of the store house, the shop doors designed for anything except what is to go through them, the hose often stretched across the shop with two blocks beside it so it can be trucked over, are all to some extent extravagant. These expenses for the nonce are trifling, but from day to day and year to year they swell into large proportions. It is probable that no other feature of any railroad shop is more noticeable than the utter lack of communication between the departments. A machinist in a pit, who needs a bolt made in the blacksmith shop, must go himself and personally give the order. If an old bolt is to be repaired for lengthened, he must carry it. It is obvious that this could be more easily and cheaply done by automatic carriers; while pneumatic tubes or telephones could form the medium for the detailed explanation, the former preferable, because sketches could, if necessary, be sent. Automatic devices could also with economy be used in delivering orders from foremen to the store, and largely in the delivery of light material to the shops.

In road material the degree of uniformity which is influencing the construction of rolling stock has not been noticeable, largely due to the fact that there has not been the refining influences of conventions composed of men interested in reaching a general uniformity.

Hand cars are quite an expensive part of railroad equipment, and only in so far as the condition which a diversified country sometimes makes a necessity should they be allowed to vary in design. A few pairs of wheels, also a sufficient stock of journal boxes and brasses, cranks and gears, all of uniform pattern, should be capable of being sent to any isolated section with the assurance that they will be certain to fit.

The same principle should apply to track jacks, track drills, push cars, velocipedes, clay picks, spike mauls, coal picks, etc. It is a small matter that the eye designed for the handle in a spike maul, clay pick or coal pick should be uniform, as far as the value of the tool itself is concerned; but the fact that different sizes of handles must also be provided is obviously an inconvenience, if not perhaps at times an additional expense, and sometimes productive of delays from the fact that the wrong handle and pick may get together at some time, and, from their unfitness for each other, render each for the time being useless.

Track gages and levels should be systematically corrected by templates absolutely correct and in a uniform manner; not only when they leave the stores, but on regular occasions when they are in service. That their constant use disarranges their accuracy is sufficient reason for a constant system of inspection and regular periods of correction This also applies to wheel and tire gages in shops.

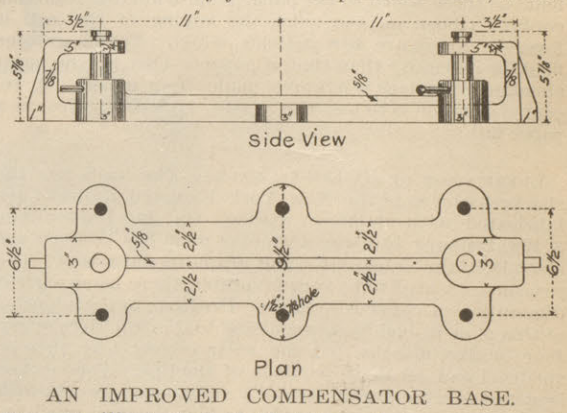
Circulation in Steam Boilers.

Evidence of the abnormal amount of attention now being given to the merits and demerits of water tube boilers is found in the fact that three of the papers read at the meeting of the Institution of Naval Architects were concerned more or less directly with the consideration of this important topic. These papers have not yet been received but the Mechanical World of London reports that one of the most interesting of these was that of Professor Watkinson, who dealt very completely with the question of circulation in water-tube boilers. Discussing the problems involved, he said that when each tube had direct connection with water and steam drum, the greater the inclination of the tubes to the horizontal the better the circulation, while in the header system of Belleville, Babcock & Wilcox, and Niclausse, 15 deg. was the best angle for circulation; provided the currents from the different tubes did not interfere with each other.

When the steam discharge into the drum was at or above the water level in the drum, the velocity of circulation was greater than when the discharge was under the water level; moreover, priming was less likely to take place, because the water level was but slightly disturbed. In this case curved tubes were preferable, to admit of free expansion under the variable temperature at the lighting of the fires, if the ends were not left free, as in the Belleville type. When the discharge was below the water level in the steam drum, the temperature was less variable, and provided the circulation was good, straight tubes might be used without difficulty. We note with interest that efforts continue to be made to improve the circulation in ordinary internally fired boilers. One of the latest devices for accomplishing this desirable object is that of M. Dubian, of the Association of Steam Users in the Southeast of France. In his arrangement a horizontal diaphragm is riveted inside the shell and above the crown of the furnace, and from this depend deflector plates which partially surround the flue, reaching to within about four inches of the bottom of the boiler. The horizontal diaphragm carries a series of tubes, the upper ends of which are just above the water level, while the lower extremities are an inch or two below the diaphragm. When the boiler is fired, it is claimed that the tubes are traversed by streams of steam bubbles and water, and as the latter is taken from the lower part of the boiler the circulation is much improved. From the description this apparatus would appear to be rather a cumbersome boiler appendage, but it seems to be a very efficient circulation promoter, for according to recent trials the quantity of water evaporated per unit of heating surface can in this way be doubled, while the amount evaporated per pound of fuel is increased by eight to ten per cent.

AN IMPROVED COMPENSATOR BASE.

In a paper presented before the Railway Signaling Club last October and published in the RAILWAY REVIEW of November 9, 1895, Mr. H. D. Miles, signal engineer of the Michigan Central Railroad, described several new departures in the construction of interlocking apparatus, some of which have since been adopted by other roads in new work done since that time. Among the designs used by Mr. Miles was that for a "lazy jack" compensator base, which



AN IMPROVED COMPENSATOR BASE.

was not illustrated at that time but possesses sufficient interest to warrant showing it now. The accompanying illustration gives the dimensions and the arrangement of the base, which is seen to consist of the ordinary base casting but the crank pivot pins are reinforced at the upper ends after the manner which has for some time been followed in making ordinary crank bases. The advantages of having an upper as well as a lower support to these pins is appreciated by all who have had experience in maintaining the old style bases, and those roads which are constructing signaling apparatus of this kind would do well to employ this form. It is believed that the companies furnishing interlocking apparatus have taken up the design and loose pins in compensator bases will soon be a thing of the past.

EUROPEAN ELECTRIC RAILWAY STATISTICS.

The marvelous rapidity with which electric traction was adopted in the United States could not but have its influence on the city passenger traffic of other countries, but it has taken practically ten years to convince Europe that the horse could no longer compete for dividends with the trolley. But now that our friends across the ocean have become convined of that fact, it would seem as if they were on the road to match our own record in time, as shown by the excellent table of statistics compiled by our contemporary, "L'Industrie Electrique." The accompanying tables, which show the number and character of the roads now in operation in Europe, indicate very clearly the trend of electric railroading abroad. The trolley, of course, far outnumbers all other systems. Of the others, we may ignore practically those roads with central rail, as they are mostly of short length, where placed on the surface; or they are so situated that they are rendered inaccessible to the public, such as in the city and South

London tunnel, or on the Liverpool elevated railway. But the eight accumulator roads in Europe, representing an increase of four during the year, are more significant. The largest system of this type comprises three roads in Paris, operating 19 storage battery cars, some of which have been doing duty since 1892, and the addition of the third road last May seems to indicate that for the conditions there existing the storage car has proved satisfactory. We would also draw attention to the Hague-Scheveningen road, in Holland, which has been in operation since 1890, and is now operating 14 motor cars and two trailers. Considering the popularity of the storage battery for stationary purposes abroad, it is somewhat disappointing to find but three or four roads which have adopted them in the stations as load equalizers, but that this will follow in due course of time we have not the slightest doubt.

Countries	Length of track, kilm.	Power in K. W.	No. motor cars.
Germany	406.4	7,194	857
England	94.3	4,243	143
Austria-Hungary	71.0	1,949	157
Belgium	25.0	1,120	48
Bosnia	5.6	75	6
Spain	29.0	600	26
France	132.0	4,490	225
Holland	3.2	320	14
Ireland	13.0	440	25
Italy	39.7	1,890	84
Sweden and Norway	7.5	225	15
Portugal	2.8	110	3
Roumania	5.5	140	15
Russia	10.0	540	32
Servia	10.0	200	11
Switzerland	47.0	1,559	86
Total	902.0	25,095	1,747

Countries.	Roads with overhead conductors.	Conduit roads.	With central rail.	With accumulator.	Total No. of roads.
Germany	35	1	.	.	36
England	7	1	8	1	17
Austria-Hungary	6	1	.	2	9
Belgium	3	.	.	.	3
Bosnia	1	.	.	.	1
Spain	2	.	.	.	2
France	11	.	1	4	16
Holland	.	.	.	1	1
Ireland	1	.	.	.	1
Italy	7	.	.	.	1
Sweden and Norway	1	.	.	.	1
Portugal	1	.	.	.	1
Roumania	1	.	.	.	1
Russia	2	.	.	.	2
Servia	1	.	.	.	1
Switzerland	12	.	.	.	.
Total	91	3	9	8	111

Conduit roads still seem to lag, but, when their cost is considered, this ought to excite little comment. Indeed, in spite of the slow progress in this direction in the past, even in the United States, we believe that there will be much work of this character done in the near future. The conduit roads in New York, Washington and elsewhere will soon determine the practicability of this type of road, and we have no fear for the final outcome. A glance at the above tables brings out in strong relief the enterprise of Germany in electric railroading, in which her record is well abreast, if not ahead, of that of her electric lighting work. The Germans, indeed, may well be called the Yankees of Europe in electrical matters, and her neighbors on the continent, as well as across the channel, ought to profit by her example. Perhaps a glance at our own street railway statistics may act as a further stimulus, and hence we give the record below, which is as nearly correct as it can be obtained. considering the enormous extent of the industry:

Length of track, electric roads	miles,	10,363
Length of track, horse roads	miles,	1,914
Length of track, cable roads	miles,	632
Length of track, miscellaneous roads	miles,	679
Number of cars, electric		24,745
Number of roads, electric		976

In Pittsburgh a cable plant that has cost over $10,000,000 is about to be ripped out to make way for electricity. It is really a pity not to have used the cable trough for a conduit system; but, probably the roadbed had deteriorated too much to allow of such a thing being done. The incident shows, however, the way things are tending in America.—Electrical Engineer (London).

Master Car Builders' Association.

The committee on subjects for the 1897 convention request from each member of the association that they send to the chairman a list of one or more subjects which will, in their opinion, be desirable for committee work during the coming year, The committee also ask for suggestions of subjects for topical discussions for the noon hours during the 1896 convention. Suggestions may be sent to A. M. Waitt, general master car builder, Lake Shore & Michigan Southern Railway, Cleveland, O., not later than June 1, 1896.

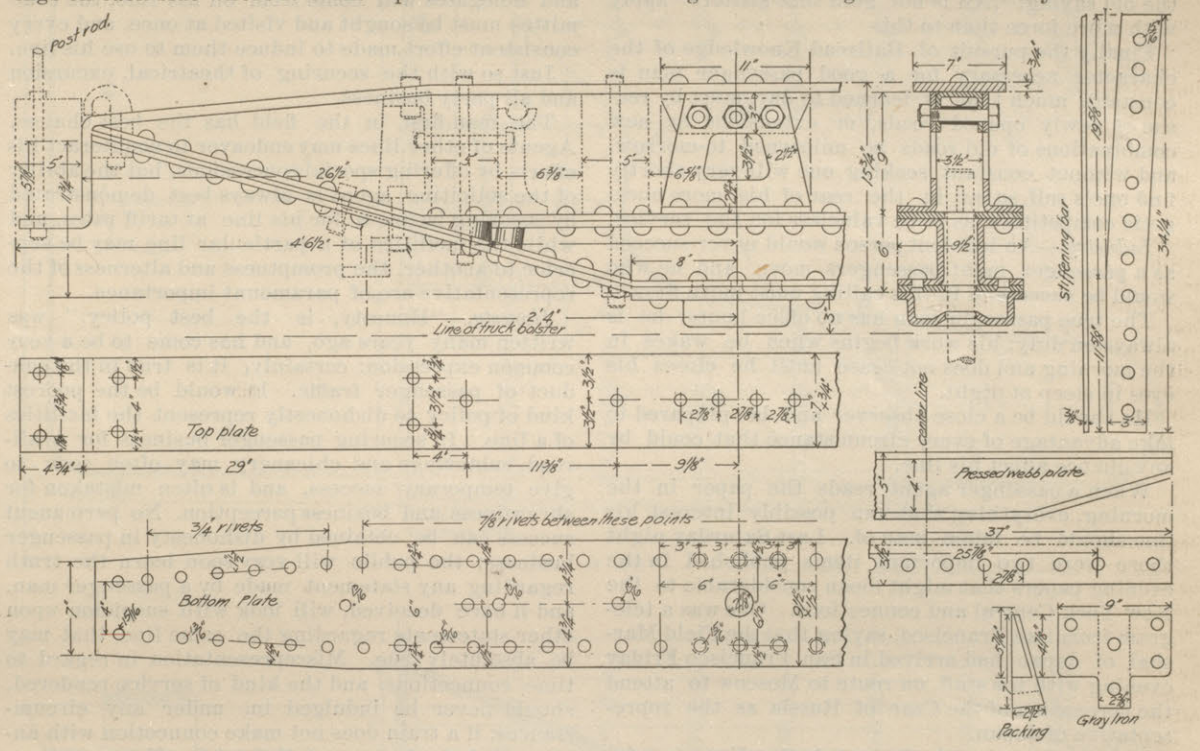
BODY BOLSTER, 70,000 LB. CAR—NORTHERN PACIFIC RAILWAY.

Attention was called especially to cars of 70,000 lb. capacity during the discussion upon the subject of large cars before the New York Railroad Club at its February meeting of this year. Through the courtesy of Mr. John Hickey, superintendent of motive power, Northern Pacific Railroad, we are enabled to illustrate the most interesting details of the construction of these large capacity cars upon that road. The body bolster has been selected for description first as it is one of the most interesting parts of the design and is applied to several types of large capacity cars.

The details of the bolster are shown in the accompanying illustration in which it is seen to be composed of a top member of 7 x ¾ in. steel extending across the bolster and bent downwards at the ends for the support of the sidesills. The compression member is composite. At the center a pressed web plate is placed upon each side of the bolster, the channel forms of which are seen in the sectional view of the bolster complete. Upon the top of this web plate is a half inch plate 9½ in. wide which extends out horizontally to a point near the side bearings on each side where it turns upward on an incline to meet the top plate at the angle near the corner of the side sills. From this corner an intermediate plate one-half inch thick extending down to the pressed web plate and a bottom plate also one-half inch thick and extending clear across the bolster are riveted together and to the web plate making a continuous piece of riveted work for the lower member of the bolster. Where the three plates are riveted together outside of the side bearings, they taper down to 7 in. in width at the outer extremities and are 9½ in. wide at the side bearings. At the outer ends of the pressed web plates special packing washers are fitted to assist in making a tight joint in the angle formed by the lower plates near the side bearings. At the center the Northern Pacific standard pressed steel center plate is secured by rivets as shown. The truss rod saddles are shown in dotted lines as is also one of the side bearings. There is a casting fitted between the upper and lower members of the bolster at each side bearing which gives the top member its angle. The sectional view shows the arrangement of building up the center of the bolster. A plate bent to the form of a channel 11 in. long is riveted to the under side of the top member the flanges of which are 3 in. deep. To this channel two plates or diaphrams are bolted with flanges at an angle at the bottom where they are riveted to the top plate and the upper flanges of the web plates of the lower member. The bolts through the short channel are passed through pieces of gas pipe which form thimbles for the support of the channels against crushing.

It will be seen that this construction is very strong and for further stiffening of the truss ⅞ in. bolts are passed through the bolster and through the sills. The construction of the bottom member permits of the presence of these bolts and the member is not weakened except by the amount of material cut out for the holes. The material is required to be of open hearth steel preferably made by the acid process, the phosphorus not to exceed 0.06 per cent in acid steel and 0.04 per cent in basic steel. The sulphur is not to exceed 0.05 per cent. The ultimate strength is required to be between 58,000 and 64,000 lbs. per square inch, and for the rivets from 52,000 to 60,000 lbs. The elastic limit of the steel plate is to be 0.6 of the ultimate strength. The elongation is required to be 20 per cent in 8 in. and the reduction of area to be 40 per cent. All the rivet and bolt holes are drilled to full size or punched to not less than $\frac{3}{16}$ in. smaller than the diameter of the cold rivet and then reamed to full size, not less than $\frac{1}{16}$ in. is to be removed from any part of a hole.

The bolt and rivet holes in component pieces are required to match absolutely and all burrs and rough edges are carefully removed before putting the parts together. All abutting sheared edges are milled and put together with driving fits. The castings are of malleable iron. These bolsters are used under box, flat and furniture cars of 70,000 lbs. capacity and also in a modified form under twin hopper bottom coal cars. The following details with regard to the box car are interesting in connection with the bolsters. The length of the car over end sills is 42 ft., width over side sills 9 ft. I in.; length inside 41 ft.; width inside 8 ft. 6 in. The distance between centers of body bolsters is 32 ft.; the weight of the car body is 20,000 lbs. and of the trucks 12,000 lbs., making the total weight of the car body and trucks



BODY BOLSTER 70,000 LBS. CAPACITY CAR—NORTHERN PACIFIC RAILROAD.

32,000 lbs. There are six sills in this car, two center sills 5 x 9 in. in section, two intermediate sills, and two sills 5 x 9 in. There are also two auxiliary sills of 2½ x 9 in. section, one on each side of the car between the side and intermediate sills and resting upon the needle beams. The longitudinal sills are all of long leaf yellow pine while the end sills and needle beams are of white oak, the former 6 x 10⅝ in. and the latter 5 x 9 in. in section.

THE SUCCESSFUL PASSENGER MAN.

GEO. H. DANIELS, Gen. Pass. Agent N. Y. C. & H. R. R. R., in New York Railroad Men.

There are five requisites to the success of any man who wishes to be an efficient representative of the passenger department of a great railroad:

Knowledge of the line, its facilities and its connections.

Industry.

Affability and courtesy.

Promptness.

Honesty.

Knowledge.—A thorough knowledge of the line of road is of prime importance to one who desires to attain success in passenger business—knowledge of the facilities, of the connections, train service, points of interest, etc.; in addition should be had a general knowledge of the same features of the immediately connecting lines, particularly so far as through car service is conducted. Incidentally the student will find it of great advantage to be at least fairly well informed on the geography of the country, the location of the cities and towns of prominence especially, as well as their distance from the large commercial centers, the time occupied in reaching them, the various routes by which they can be reached, their chief attractions, etc.

As regards the knowledge of the employing line, this can probably be best acquired by close personal observation gained by journeys over the line, by visits to the points of junctions with the branches,

and with other lines; and right here I might say, that while travel in the ordinary day coaches may not be quite so comfortable as in sleeping and drawing room cars, the opportunities presented for the accumulation of information are far greater in the former than in the latter and will assist very materially in preparing the student for a position where day coach travel will not be a necessity, or parlor car travel a luxury. There is probably no road in this country, with the exception of the New York Central, the number of those through passengers carried in day coaches does not very greatly exceed the number of sleeping and parlor car passengers, and as a rule it is with the day coach passenger you will be called to work, and one possessing the knowledge necessary, and the ability to impart that knowledge successfully to this class will find the way very smooth in an effort to take care of the other class.

Time is too limited to go at all into detail as to the various sources from which a general knowledge can be obtained. Maps, folders, guide books, etc., etc., are published by the various transportation lines without end, and should be carefully studied, and the facts carefully gleaned and stored for future use, bearing in mind that to no class of literature does the old saying, ',All is not gold that glitters'' apply with more force than to this.

Finally the pursuit of Railroad Knowledge of the character necessary for a good passenger man is constant; much that is learned to-day, must by reason of newly opened roads, or extensions by new combinations of old roads be unlearned to-morrow, and without constant seeking one will very shortly find one's self so far in the rear of his more energetic competitors as to be valueless for the service.

Industry.—An indolent person would never succeed as a passenger man; passengers move, and he who would be successful in this calling must move first.

The true passenger man has no office hours; he is always on duty; his work begins when he wakes in the morning and does not cease until he closes his eyes in sleep at night.

He should be a close observer and be prepared to take advantage of every circumstance that could by any chance affect his line.

When a passenger agent reads the paper in the morning, everything that can possibly interest his line should be taken note of. Last Saturday night there were two important items published in the evening papers that might mean considerable to the New York Central and connections. One was a telegram from San Francisco, saying that the Field Marshal of Japan had arrived in San Francisco Friday evening with his staff, en route to Moscow to attend the coronation of the Czar of Russia as the representative of Japan.

We are always on the lookout in San Francisco for the arrival of any important man. I have telegraphed our agent in San Francisco to be sure and see the field marshal and staff and get them to go over our road and see Niagara Falls on their way east.

Probably every passenger man who read that item had in mind the securing of this business.

The other item was that Tammany Hall would take a large delegation to Chicago in June to the Democratic convention, and gave the names of the committee in charge of its transporation. Our general eastern passenger agent will, of course, see the members of the committee and try to secure this business. The true passenger man has no spare hours. He is always on duty and thinking about his work all the time, clipping out items similar to the above, so that he can make the best possible use of them, and in a thousand ways looking out for the interest of his line.

Affability and Courtesy.—A great deal might be said under this head, but I think you understand it.

If there be any truth in the saying that "Clothes oft proclaim the man," or "that a man is known by the company he keeps," it is equally true that the opinion of the public regarding transportation lines is generally formed according to the dealings with the representative. If a surly and impolite agent or train employe has the effect of hurting the business of the line, the same applies equally well to the representative whose duty it is to secure traffic. Politeness and courtesy cost nothing, and courtesy, politeness and tact are important aids in the securing of passenger business. This rule applies alike to all employes whose duties bring them into contact with the public.

Promptness.—Promptness and alertness may be considered essential requisites to the successful passenger man. He must get ahead of his competitors.

While competition in these days is keen and active in all branches of commercial and industrial enterprises, it is particularly so in the effort to secure traffic for our complex railway systems.

In the case of two storekeepers struggling for business in a community where sufficient trade for one only existed, the stronger would gradually crowd the other to the wall and compel him to close his doors.

The rule of the "survival of the fittest" cannot to the same extent apply to railways. They are here to stay. What if three or four separate companies are striving for trade in the same community, or if their rails extend paralleling one another through the same territory for hundreds of miles, like so many greedy outstretched hands? Their franchises will not be surrendered, their organizations dissolved or their rails taken up. Ownership may change, but the railway is a permanent thing, and upon its facilities and the ability of its officers and agents to secure and control traffic will greatly depend its financial status.

If the agent learns of a family in the country who intend moving to the west, his duty is to visit them at once, give them all the information they may need for their contemplated trip, and place before them in the strongest manner the facilities of his particular line. If a convention is to be held, and delegates will come from off his line, the committee must be sought and visited at once, and every consistent effort made to induce them to use his line.

Just so with the securing of theatrical, excursion and all party business.

The man first in the field has the best chance. Agents of other lines may endeavor to counteract his efforts by offering special concessions, but the ability of the soliciting agent is always best demonstrated by securing business for his line at tariff rates, and while the facilities of a particular line may be superior to another, the promptness and alterness of the representative are of paramount importance.

Honesty.—"Honesty, is the best policy," was written many years ago, and has come to be a very common expression; certainly, it is true in the conduct of passenger traffic. It would be the poorest kind of policy to dishonestly represent the facilities of a line. In securing passenger business for a railroad, subterfuge and chicanery may often seen to give temporary success, and is often mistaken for shrewdness and business perception. No permanent success can be obtained by dishonesty in passenger business; the public will very soon learn the truth regarding any statement made by a passenger man, and if once deceived, will look with suspicion upon other statements regarding the same line, that may be absolutely true. Misrepresentation in regard to time, connections, and the kind of service rendered, should never be indulged in, under any circumstances; if a train does not make connection with another, it is far better to tell the intending passenger the truth, than to have him find out, when it is too late, that he has been deceived. A straight forward statement to all intending passengers in regard to what your line can and will do, and the entire avoidance of any advertisement of your competitors, by attempting to decry them is, in my opinion, the wisest course to pursue. Every competing line has some friends, and no person, who is a friend to a railroad, likes to hear it run down by the representatives of a competing line.

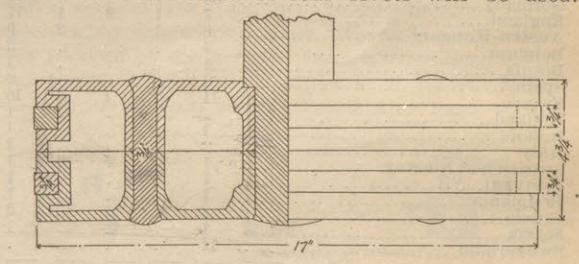
It pays to be honest in connection with railroad work as in any other, and an agent who is conscientious and honest in his statements, energetic, polite and affable, and who also thoroughly understands his duties will make an ideal representative. Honesty in business affairs is just as essential to success as it is in a man's personal and social life.

Question: Where do the men come from who have comparatively good positions in the passenger department? *Ans.* The plan I think in most general passenger agents' offices is that a boy begins as an office boy copying and filing letters and doing errands about the building from one department to another; then he is made a clerk, under the chief clerk for instance, and is gradually promoted from one small position to another until he has an opportunity to learn something about rates, divisions, or advertising; then if he is capable and earnest he will be promoted as rapidly as he gains knowledge of the business and opportunities for advancement occur. When he gets to be a rate clerk that gives him a chance to obtain a general knowledge of the business of the passenger department. Then he may be made chief clerk of the department; then made assistant passenger agent and then general passenger agent. Sometimes he is taken out of the office and made a city passenger agent or traveling passenger agent; then he may be appointed a district passenger agent and from there promoted to a general agent at some important point or in charge of a territory.

Question:—What chance does a stenographer have for promotion? *Ans.* That depends largely upon the man himself. While stenographers are important clerks I do not think they have the same chance for promotion that an ordinary clerk has. Stenographers get better pay but are more likely to remain stenographers than to be promoted to other positions, though there are some very notable exceptions. A gentleman has recently been made general manager of an important railway, with a salary of from $30,000 to $40,000 per annum, who only a few years ago was a stenographer and private secretary to the general manager of a western line. This gentleman is a very remarkable man and his promotion is a rare exception. There are many stenographers, however, who had held positions under general managers or general superintendents, who have been made assistant superintendents, or who have gone to other transportation departments into higher positions. One I have in mind who was, about 1885, a stenographer, and was made general passenger agent right from his position as private secretary to the general manager; later on he was made general manager. These are two very rare and unusual cases.

PISTONS OF MALLEABLE IRON.

The accompanying illustration is made from a drawing just received from Mr. Joseph F. Blackwood, general foreman at Charleston, S. C., of the South Carolina & Georgia Railway. This piston is now upon trial upon that road upon a 17 x 24 in. locomotive built by the Baldwin Locomotive Works and it is reported to be giving excellent satisfaction. The thickness of the castings is $\frac{7}{16}$ in. the pistons being made of two pieces parted in the middle and held together by four $\frac{3}{4}$ in. rivets as shown in the illustration and for pistons larger than 17 in. in diameter six instead of four rivets will be used.



Hubs are cast for these rivets and tight fit is secured upon these as well as the ring joint. The weight of the piston complete with a three inch steel piston rod and two $\frac{3}{4}$ in. packing rings is 175 lbs. as against 265 lbs. which was the weight of a combination consisting of the cast iron spider, follower plate, pull ring and packing rings, making a saving in weight of 95 lbs. or 28 per cent in favor of the malleable construction.

Unless the joint between the two portions of the piston is made with extreme nicety, it might be expected that water would find its way to the interior of the piston which would increase its weight and neutralize the advantage obtained by the malleable iron. This however, according to Mr. Blackwood has not yet given trouble, and if it does, it would seem that the piston might be so designed as to utilize this material in such a form as to entirely obviate this danger. The good record which has been made by malleable iron in car construction, has led to this trial and entirely satisfactory results are anticipated in the new departure in applying it to locomotive construction.

MR. JUSTICE HARLAN'S DISSENTING OPINION IN THE IMPORT RATE CASE.

The following is sent us as of interest in connection with the recent decision of the United States supreme court in the import rate case.

The dissenting opinion of Mr. Justice Harlan (Mr. Justice Brown concurring, and the chief justice also dissenting) in the "Import Rate Case" has just been printed. The majority of the United States supreme court held in the recent decision that the interstate commerce law does not contain a rigid rule requiring rail carriers in this country to charge the same rates on domestic as on through import traffic of like kind from a port of entry in the United States to the same destination, but that circumstances and conditions originating in the foreign country could be taken into account in determining the proper relation of rates for transportation in this country on domestic and imported goods of similar description, and that the interests of the railroad carrier must also be considered. The dissenting opinion disagrees with this view, and holds, with the Interstate Commerce Commission, that the railroad company can lawfully make no difference in rates for like service performed in this country.

Mr. Justice Harlan says that if the discriminations, shown in this case, where American goods were charged

from New Orleans to San Francisco three or four times more than for the entire service from Liverpool through New Orleans to San Francisco, can be made, or if any difference in rates can be allowed, then all the railroads in the United States may and will indulge in like practices; that if such discrimination by American railways, "Against goods, the product of American skill, enterprise and labor, is consistent with the act of congress, then the title of that act should have been one to regulate commerce to the injury of American interests and for the benefit of foreign manufacturers and dealers." If the position of the Texas & Pacific Railway Co., is sustained, the opinion states, inland rates on foreign goods for transportation in this country will be so much lower than rates on American goods and products that the owners of foreign goods and products may control the markets of this country to the serious detriment of vast interests that have grown up here and in the protection of which against unjust discrimination all of our people are deeply concerned.

"Does any one suppose that if the interstate commerce bill, as originally presented, had declared in express terms that an American railroad company might charge more for the transportation of American freight between two given places in this country than it charged for foreign freight between the same points that a single legislator would have sanctioned it by his vote? Does anyone suppose that an American president would have approved such legislation? No one would expect such a bill to pass an American congress. If not, we should not declare that congress ever intended to produce such a result, especially when the act it has passed does not absolutely require it to be so interpreted."

The learned justice gives an illustration of two lots of freight at New Orleans for San Francisco, one lot manufactured in this country, the other, goods of like kind, made in Europe and shipped through on a through bill of lading; and also of two passengers at New Orleans for San Francisco, one an American, the other a foreigner coming from Europe on a through ticket for San Francisco. The railroad company contends that it may, under the act to regulate commerce, carry the foreign freight or passenger from New Orleans to San Francisco for less than it charges for carrying the American freight or passenger from New Orleans to San Francisco, on the ground that, because of competitive routes from Europe to San Francisco, it will otherwise lose the traffic. "Such an interpretation enables the great railroad corporations of this country to place American travelers, in their own country, as well as American interests of incalculable value, at the mercy of foreign capital and foreign combinations—a result never contemplated by the legislative branch of the government."

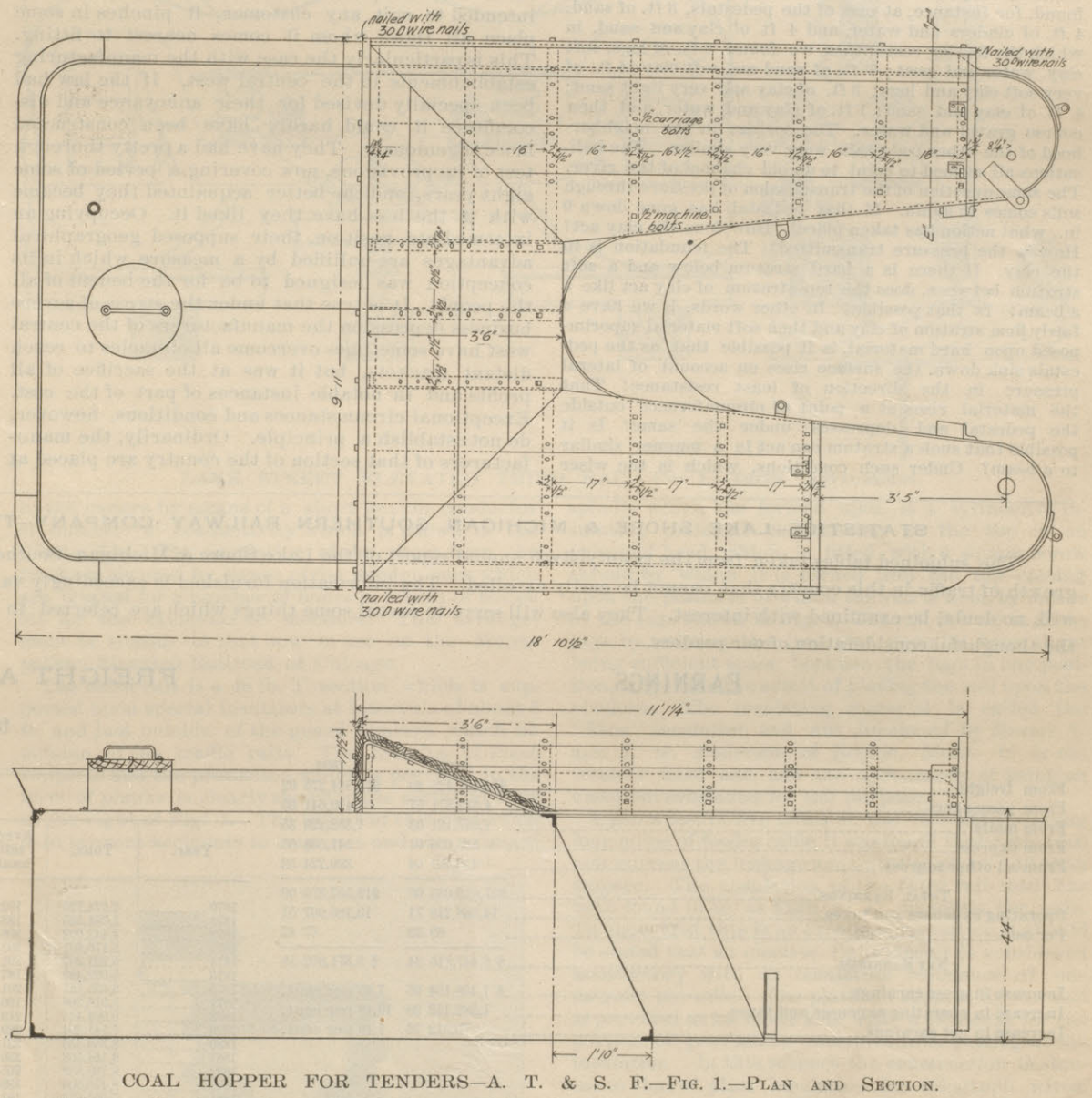
The opinion also contains the following with reference to commercial organizations: "It is said that only boards of trade or commercial exchanges have complained of the favorable rates allowed by railroad companies for foreign freight. It seems to me that this is an immaterial circumstance. So long as the questions under consideration were properly raised by these boards and exchanges, it was unnecessary that individual shippers, producers and dealers should intervene in the proceedings before the commission. But, I may ask whether the interests represented by these boards of trade and commercial exchanges are not entitled to as much consideration as the interests of railroad corporations? Are all the interests represented by those who handle, manufacture and deal in American goods and merchandise that go into the markets of this country to be subordinated to the necessities or greed of railroad corporations?" "Congress, by enacting the interstate commerce act, did not seek to favor any special class of persons, nor any particular kind of goods because of their origin. It intended that all freight of like kind, wherever originating, should be carried between the same points, in this country, on terms of equality."

Safety of Railway Traveling in England.

At the annual dinner of the headquarters staff and station masters of the London & South-Western Railway which was held recently, Sir Charles Scotter, who presided, is reported to have said in reply to the toast "The Station Masters of the London & South-Western Railway" that on that road there were about 280 station masters. As showing the great responsibility resting upon a station master, he mentioned that at Waterloo Mr. Hilditch had under his charge quite a little army. There were 37 parcels' clerks, 25 booking clerks, 18 telegraph clerks, 19 inspectors, and the rank and file, porters, shunters, cleaners and other men on the permanent staff of the company no less than 504, so that about 600 men were permanently engaged in carrying on the work at Waterloo station alone. As an instance of what that work was, Sir Charles stated that the Saturday before Whit-Monday 945 trains, and on Whit-Monday 985 trains, passed in and out of Waterloo Station in the twenty-four hours, and that without the slightest accident of any kind or description. As a contrast there was another station on the system where the entire staff consisted of the station master and one boy. During the last five years the South-Western had carried 285 millions of people, and during that time it had never killed a single passenger, whereas, in the streets of London alone between 200 and 300 were killed every year. In 1892, which was the last published record, 247 people were killed in the streets of London, whereas, that particular year on the whole of the railways of the country, carrying thousands of millions of people, only five passengers were killed. That seemed to show that there was some truth in the statement that the safest place a person could get into was a railway carriage. Last year the South-Western carried 62,000,000 people, and during the last five years the passenger traffic had increased at the rate of 2,000,000 a year. The South-Western was essentially a passenger line, and nothing did more to promote the passenger traffic of a railway than a reputation for safety and punctuality, both of which the South-Western had well earned.

COAL HOPPERS ON STANDARD TENDERS—A. T. & S. F. PAILWAY.

In order to do away with the racks and boards which have been used upon the standard tenders of this road and which are always unsightly and inconvenient, the arrangement of sloping surfaces shown in the illustration herewith has been made by Mr. John Player, superintendent of machinery of the Atchison Topeka & Santa Fe Railway. This arrangement provides ample coal space and confines the coal to the forward part of the tender. The load is carried upon the tank on sloping surfaces which admits of the coal being brought forward by gravity within reach of the firemen, without unnecessary shoveling. The plan illustrated consists of building a hopper of 1¼ in. plank surrounding the open coal space of the tank and placed upon the tank in such a way as to project 17½ in. above the top of the tank proper at the outside. The coping is an 8 in. plank, placed upon the top of the fender upon the two sides and supported as shown in the small sectional view upon ½x2 in. iron brackets which are placed at intervals of 6 in. along the length of the hopper. These brackets are riveted at the inner edges of the water legs as shown in this sectional view. At the back, the hopper is supported by three brackets as shown in the large plan view. The length of the tank is 18 ft. 10½ in. the hight of the tank proper is 4 ft. 4 in. The hopper is so made as to go upon the tanks already built without changing them. The illustration also shows the inclined curved surface of the tanks at the rear of the coal space.



COAL HOPPER FOR TENDERS—A. T. & S. F.—FIG. 1.—PLAN AND SECTION.

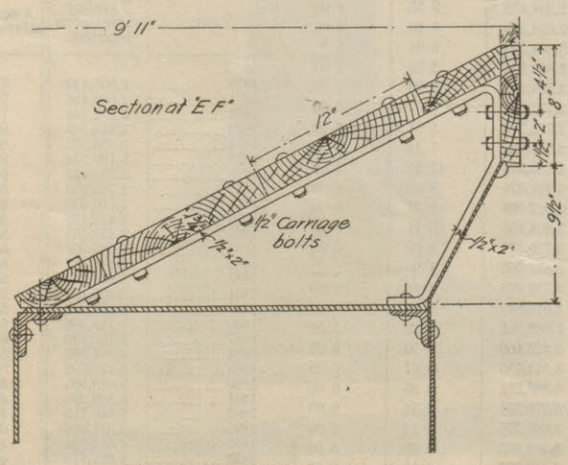


FIG. 2.—SECTION AT E F.

Raising a Highway Bridge.

Under the title "Experiences in an Engineer's Practice" Mr. Walter P. Rice, in a paper read before the Civil Engineers' Club of Cleveland, and published in the Journal of the Association of Engineering Societies, gives the following account of the raising of the Central Viaduct of that city in which some interesting questions are asked:

We had some trouble with settlement of pedestals on the Central viaduct, in the neighborhood of Central Way. Strange to say, the amount of settlement gradually decreased towards the river. It finally assumed such proportions that I thought something must be done. I think the maximum settlement was in the neighborhood of 9¾ in. A great many of the bents had settled, and it became noticeable on the bridge itself. Water stood on the bridge floor, otherwise it would not have been noticed by the public. We desired to raise it, and did not want a lot of sensational articles in the newspapers; so we undertook to raise it with our own bridge gang without making it public. We secured the money under some very harmless resolutions. The newspaper men were there, but being for repairs they did not comprehend it. A careful profile was made showing the exact settlement. Instead of bringing them all up to the grade line we brought them two-thirds of the way up, and at a very slight curvature that would not be perceptible to the eye, and then calculated to raise each one up to that curve. I think we raised 18 bents, and this was all done with travel (motor cars, etc.) going on overhead.

We had a total hight of 83 to 85 ft. from cap of pedestal to roadway, and 108 tons to lift on each leg of the bent, the leg being composed of two channels latticed. It was almost impossible to get any purchase anywhere to make such a lift. We had a stone cap 5 ft. 8 in. square, with a beveled edge, and only 12 in., including a 4 in. wash on each side of the post, to get our purchase for the 108 ton lift. We finally decided on a method, using very simple

apparatus. Short upright wooden bents were erected upon blocks on the stone caps and wooden cross-caps on top of these supported the I beams which carried eight rods 2⅛ in. in diameter. Reinforcing plates with a 5½ in. bored pin-hole were riveted to the web plates of the post at a convenient distance below the I beams and match holes were then bored in the webs with a tool made especially for the purpose. A 5 7-16 in. pin was slipped into place, cast iron bearing blocks on top of heavy channels were fitted up under the pin close to the webs of the post, and the channels then connected to the rods mentioned. The men worked on a platform, and each one gave a certain number of turns to the nuts on the eight vertical rods. As fast as a bent was raised 1 in. a steel plate was slipped in, and when the proper hight was reached cast iron bases were put in place. Of course, we had to make certain adjustments in the trusses as the work progressed, but the entire structure was lifted without attracting attention. We were, however, working in very tight quarters. After the work was done, the city kept track of it and found some further settlement. This led to making borings which developed a rather strange state of affairs. We found, for instance, at one of the pedestals, 3 ft. of sand, 4 ft. of cinders and water, and 4 ft. of clay and sand, in which the footing rests; then we found 10 ft. of logs, soft clay, water and peat; 6 ft. of sand and soft clay; 4 ft. of very soft clay and logs; 3 ft. of clay and very light sand; 4 ft. of clay and sand; 1 ft. of clay and water, and then course gravel and water. The borings in the neighborhood of the other pedestals were very similar. The indications all seemed to point to an old channel of the river. The same question of the transmission of pressure through soils comes in again. If that pedestal has gone down 9 in., what action has taken place? How does the clay act? How is the pressure transmitted? The foundation is in the clay. If there is a hard stratum below and a soft stratum between, does the top stratum of clay act like a a beam? Is that possible? In other words, if we have a fairly firm stratum of clay and then soft material superimposed upon hard material, is it possible that, as the pedestals sink down, the surface rises on account of lateral pressure in the direction of least resistance? That the material rises at a point of circumference outside the pedestal and depresses under the same? Is it possible that such a stratum can act in a manner similar to a beam? Under such conditions, which is the wiser course—to attempt to reduce the pressure by spreading further, or to break through the solid stratum and attempt to go down to a firmer bearing?

WESTERN MANUFACTURERS AND THE INTERSTATE COMMERCE LAW.

[FROM IRON AGE.]

The recent decisions of the supreme court, strengthening the power of the Interstate Commerce Commission, are not regarded with approval by manufacturers who do more than a local business. They had been ardently hoping that some grounds might be discovered for declaring the entire body of legislation known as the interstate commerce law unconstitutional, or for rendering it less harmful to their interests. Its strict enforcement hurts all large manufacturers in some part of their operations, either in obtaining raw material or making deliveries of finished products. Like a ready made shoe, intended to suit any customer, it pinches in some place all those whom it comes nearest to fitting. This is particularly the case with the manufacturing establishments in the central west. If the law had been specially devised for their annoyance and discomfiture it could hardly have been constructed more ingeniously. They have had a pretty thorough test of its provisions, now covering a period of some eight years, and the better acquainted they became with it the less have they liked it. Occupying an intermediate position, their supposed geographical advantages are nullified by a measure which in its conception was designed to be for the benefit of all the people. It is true that under the stress of severe business depression the manufacturers of the central west have sometimes overcome all obstacles to reach distant markets, but it was at the sacrifice of all profits and in notable instances of part of the cost. Exceptional circumstances and conditions, however, do not establish a principle. Ordinarily, the manufacturers of that section of the country are placed at a disadvantage by the strict enforcement of the interstate commerce act.

Under this act it is frequently an advantage to be located at a long distance from a buyer. The manufacturer much nearer the buyer or consumer is made to pay a considerably higher pro rata freight. This occurs when the distant manufacturer ships over two lines of railroad, and the buyer's local road makes a very low pro rata in order to cultivate its through traffic. If the local road crosses a state boundary it comes under the purview of the interstate commission, and it can then hold up the local manufacturer to a very high local rate, much in excess of its pro rata on competing goods delivered to it from another line, citing in defense of the high local rate the long and short haul clauses of the law. In such cases a distant manufacturer who is favored with very cheap raw material or other very low costs is also favored with cheap transportation, while the local manufacturer loses much of his apparent advantage of geographical position. This is offset to a considerable extent during the season of lake navigation, when a large section of the west can be reached by water at low rates from maunfacturing establishments on or near the lower lakes. But this again works a hardship on the inland establishments who must use all rail lines to reach the same markets. The lake lines are not under the control of the Interstate Commerce Commission and can make such rates as they please, while the manufacturers on the inland all-rail lines are held up to the high rates, under the long and short haul clause of the law. Nor is any latitude allowed for the magnitude of a manufacturer's business. Often his trade is so large in volume that it is exceedingly desirable, and railroads would be willing to make concessions in order to handle it, but they are precluded from doing so by the law, and the large manufacturer derives no special benefit in this respect from the magnitude of his operations. The wholesale buyer gets better terms than the small buyer on anything throughout the commercial world, except

STATISTICS—LAKE SHORE & MICHIGAN SOUTHERN RAILWAY COMPANY—TWENTY-SIXTH ANNUAL REPORT.

The subjoined tables taken from the twenty-sixth annual report of the Lake Shore & Michigan Southern Railway will afford a comparison indicative of the growth of traffic in this country that cannot be easily excelled. The information furnished is exceedingly valuable to the student of railway problems and the tables will, no doubt, be examined with interest. They also will serve to reveal some things which are referred to in our editorial columns and which are commended to the thoughtful consideration of our readers.

EARNINGS.

	1895.	1894.
From freight	$14,157,425 40	$12,844,275 02
From passengers	4,512,371 57	4,420,641 55
From mails	1,347,121 03	1,352,220 35
From express	582,636 01	541,508 65
From all other sources	416,481 04	399,224 52
TOTAL EARNINGS	$21,016,035 05	$19,557,870 09
Operating expenses and taxes	14,568,219 71	13,186,067 51
Per cent	69 32	67 42
NET EARNINGS	$ 6,447,815 34	$ 6,371,802 58
Increase in gross earnings	$ 1,458,164 96	7.45 per cent.
Increase in operating expenses and taxes	1,382,152 20	10.48 per cent.
Increase in net earnings	76,012 76	1.19 per cent.

EARNINGS, EXPENSES, &c.

1870-1895—Twenty-six Years.

Year.	Miles.	Gross earnings.	Operating Expenses—including Taxes.		Net earnings.	Fixed charges.	Dividends per share of $100.	
			Amount.	Per cent.			Earned.	Paid.
1870	1013	$13,509,236	$ 8,368,821	61.95	$5,140,415	$1,828,897	$ 9 60	$ 8 00
1871	1074	14,898,449	9,779,806	65.64	5,118,643	2,121,164	8 37	8 00
1872	1136	17,699,935	11,839,526	66.90	5,860,409	2,201,459	8 55	8 00
1873	1177	19,414,509	13,746,598	70.90	5,667,911	2,654,560	6 10	4 00
1874	1177	17,146,131	11,152,371	65.04	5,993,760	3,008,193	6 04	3 25
1875	1177	14,434,199	10,531,501	72.96	3,902,698	2,810,294	2 20	2 00
1876	1177	13,949,177	9,574,836	68.64	4,374,341	2,759,989	3 26	3 25
1877	1177	13,505,159	8,963,966	66.37	4,541,193	2,775,657	3 57	2 00
1878	1177	13,979,766	8,486,601	60.70	5,493,165	2,718,792	5 61	4 00
1879	1177	15,271,492	8,934,524	58.50	6,336,968	2,754,988	7 24	6 50
1880	1177	18,749,461	10,418,105	55.56	8,331,356	2,750,374	11 28	8 00
1881	1177	17,971,391	11,278,429	62.76	6,692,962	2,725,375	8 02	8 00
1882	1274	18,225,639	11,057,807	60.67	7,167,832	3,027,000	8 37	8 00
1883	1340	18,513,656	11,001,854	59.43	7,511,802	3,498,806	8 11	8 00
1884	1340	14,843,584	9,133,522	61.53	5,710,062	3,720,670	4 02	5 00
1885	1340	14,133,506	9,287,537	65.71	4,845,969	3,867,456	1 98	----
1886	1340	15,859,455	9,731,622	61.36	6,127,833	3,712,978	4 88	2 00
1887	1340	18,710,963	11,029,798	58.95	7,681,165	3,649,645	8 15	4 00
1888	1342	18,029,627	11,310,371	62.73	6,719,256	3,608,391	6 29	5 00
1889	1410	19,487,197	12,847,452	65.93	6,639,745	3,423,469	6 50	5 00
1890	1445	20,865,760	14,220,481	68.15	6,645,279	3,344,735	6 67	6 00
1891	1445	21,431,387	14,632,670	68.27	6,798,711	3,359,251	6 95	6 00
1892	1445	22,415,382	15,803,190	70.50	6,612,192	3,375,364	6 54	6 00
1893	1440	23,685,932	17,123,913	72.29	6,562,019	3,365,375	6 46	6 00
1894	1440	19,557,870	13,186,068	67.42	6,371,802	3,402,863	6 00	6 00
1895	1440	21,016,035	14,568,220	69.32	6,447,815	3,419,500	6 12	6 00

FREIGHT AND PASSENGER STATISTICS.

1870-1895—Twenty-six Years.

FREIGHT.

Year.	Tons.	Average miles hauled.	Tons one mile.	Revenue.	Receipt per ton per mile.	Cost per ton per mile.	Profit per ton per mile.
					Cent.	Cent.	Cent.
1870	2,978,725	192.7	574,035,571	$ 8,746,126	1.504	.932	.572
1871	3,784,525	193.9	733,670,696	10,341,218	1.391	.913	.478
1872	4,443,092	208.2	924,844,140	12,824,862	1.374	.920	.454
1873	5,176,661	203.6	1,053,927,189	14,192,399	1.335	.946	.389
1874	5,221,267	191.4	999,342,081	11,918,350	1.180	.767	.413
1875	5,022,490	187.8	943,236,161	9,639,038	1.010	.737	.273
1876	5,635,167	201.2	1,133,834,828	9,405,629	.817	.561	.256
1877	5,513,398	195.9	1,080,005,561	9,476,608	.864	.573	.291
1878	6,098,445	219.8	1,340,467,826	10,048,952	.734	.474	.260
1879	7,541,294	229.9	1,733,423,440	11,288,261	.642	.398	.244
1880	8,350,336	221.7	1,851,166,018	14,077,294	.750	.435	.315
1881	9,164,508	220.6	2,021,775,468	12,659,987	.617	.414	.203
1882	9,195,538	205.8	1,892,868,224	12,022,577	.628	.413	.215
1883	8,478,605	199.3	1,689,512,415	12,480,094	.728	.452	.276
1884	7,365,688	191.5	1,410,545,674	9,358,816	.652	.426	.226
1885	8,023,093	199.7	1,602,567,035	9,031,417	.553	.399	.154
1886	8,305,597	191.7	1,592,044,766	10,329,625	.639	.410	.229
1887	9,326,852	197.7	1,843,785,896	12,547,923	.670	.418	.252
1888	9,069,857	198.4	1,799,104,045	11,629,174	.636	.430	.206
1889	10,020,599	185.5	1,859,009,822	12,545,810	.664	.479	.185
1890	11,531,266	187.0	2,156,677,869	13,759,123	.626	.458	.168
1891	12,019,016	180.4	2,168,727,231	13,893,639	.628	.456	.172
1892	13,643,747	178.5	2,435,079,712	14,851,475	.599	.436	.163
1893	13,142,844	184.7	2,427,692,020	14,490,259	.587	.461	.126
1894	12,142,256	180.9	2,196,244,568	12,844,275	.572	.406	.166
1895	14,382,641	172.1	2,475,757,176	14,157,425	.561	.410	.151

PASSENGERS.

Year.	Number passengers carried.	Average distance.	Passengers one mile.	Revenue.	Receipt per passenger per mile.	Cost per passenger per mile.	Profit per passenger per mile.
					Cent.	Cent.	Cent.
1870	2,065,440	77	160,500,114	$4,192,960	2.612	1.708	.904
1871	2,046,428	70	143,204,407	4,006,724	2.808	1.939	.869
1872	2,212,754	74	162,308,495	4,218,543	2.599	1.814	.785
1873	2,845,163	63	179,363,173	4,569,730	2.542	1.878	.664
1874	3,096,263	56	173,224,572	4,249,022	2.452	1.678	.774
1875	3,170,234	52	164,950,861	3,922,798	2.378	1.824	.554
1876	3,119,923	56	175,510,501	3,664,148	2.090	1.515	.575
1877	2,742,295	50	138,116,618	3,203,200	2.319	1.647	.672
1878	2,746,032	49	133,702,021	3,057,393	2.287	1.276	1.011
1879	2,822,121	50	141,162,317	3,138,004	2.223	1.174	1.049
1880	3,313,485	53	176,148,767	3,761,008	2.135	1.086	1.049
1881	3,682,006	56	207,953,215	4,134,789	1.988	1.120	.868
1882	4,118,832	55	227,098,958	4,897,185	2.157	1.166	.991
1883	3,909,356	55	215,715,155	4,736,088	2.196	1.278	.918
1884	3,629,196	53	190,503,852	4,133,729	2.170	1.254	.916
1885	3,479,274	51	176,830,308	3,639,375	2.058	1.250	.808
1886	3,715,508	52	191,593,135	4,020,550	2.098	1.301	.797
1887	3,752,840	55	205,761,459	4,650,654	2.260	1.255	1.005
1888	4,051,704	52	210,107,098	4,810,147	2.289	1.301	.988
1889	4,413,592	50	222,555,555	5,082,480	2.284	1.314	.970
1890	5,019,595	45	225,265,137	5,060,023	2.246	1.492	.754
1891	5,809,295	43	246,944,673	5,376,509	2.177	1.404	.773
1892	5,846,755	42	247,850,982	5,391,385	2.175	1.572	.603
1893	5,311,086	63	334,207,812	6,993,060	2.092	1.378	.714
1894	4,542,924	44	198,292,265	4,420,642	2,229	1.409	.820
1895	4,627,175	46	210,966,572	4,512,372	2,139	1.368	.771

when he attempts to buy transportation for freight on railroads coming under the jurisdiction of the United States Interstate Commerce Commission.

In one of the very few cases in which the Interstate Commerce Commission could be of actual benefit to manufacturers the supreme court has overruled them. This is in regard to through bills of lading from transatlantic ports. The commission endeavored to change the practice of railroads in carrying imported good at lower rates than those of domestic manufacture. They were sustained in the circuit court of appeals for the second circuit, but reversed in the supreme court. The old discrimination in favor of foreign tin plates is, therefore, continued, much to the discust of American manufacturers. An effort is being made to amend the law so as to prevent this discrimination. But the mere fact that the law as it exists cannot correct such an injustice is a severe commentary on its value to those whose business salvation depends upon correct principles applied to railroad transportation. Some comments on the above will be found in the editorial column.

THE AMAZON CABLE SYSTEM.

An account is given in a recent issue of The Electrician of the telegraph cable system along the Amazon river from which the following is taken:

The great advantages of direct telegraphic communication with the many important towns on the banks of the Amazon are self-evident, and have long been recognized. In 1893 an attempt was made by the Brazilian federal government to establish a land line, but after a large outlay had been incurred the line had to be abandoned, owing to the difficulties experienced in the forests and swamps bordering on the river. Application was then made to congress, with the result that by a contract made in April, 1895, the federal government granted a concession which includes important privileges—viz., the exclusive right for a term of 30 years to lay subfluvial cables in the zone comprised between Para and Manaos; an annual subsidy of £17,125 during the first 20 years of the concession; all favors granted to similar enterprises in Brazil; permission to treat with the governments of the states of Para and Amazonas for the establishment of other branch cables, any subventions granted by these governments to take effect without prejudice to the subsidy or other favor conferred by the federal government in the concession. At the expiration of the 30 years the system of cables will become the property of the federal government, which has also the power to purchase the undertaking after 10 years at a price based on the value of the works and the average profit for the preceding five years, but not less than the capital sum expended by the Amazon Telegraph Company in laying down and working the cables. The cable is to connect the city of Manaos, more than 800 miles up the Amazon, the capital of the state of Amazonas and the chief market of the india rubber trade in Brazil, with the important city of Para at the mouth of the river, with intermediate stations or branch lines at Pinheiro, Mosqueiro. Soure, Cameta, Breves, Gurupa, Chaves, Macapa, Monte Alegre, Santarem, Alemquer and Obidos, all in the state of Para, and Parintins and Itacoatiara in the state of Amazonas. At Para the cable joins the land lines of the Brazilian government, and is in touch with the cables of the Western & Brazilian Company, connecting with the rest of Brazil and the Argentine Republic, whilst through the cables of the Brazilian Submarine Company Manaos is in communication with Europe and the rest of the world.

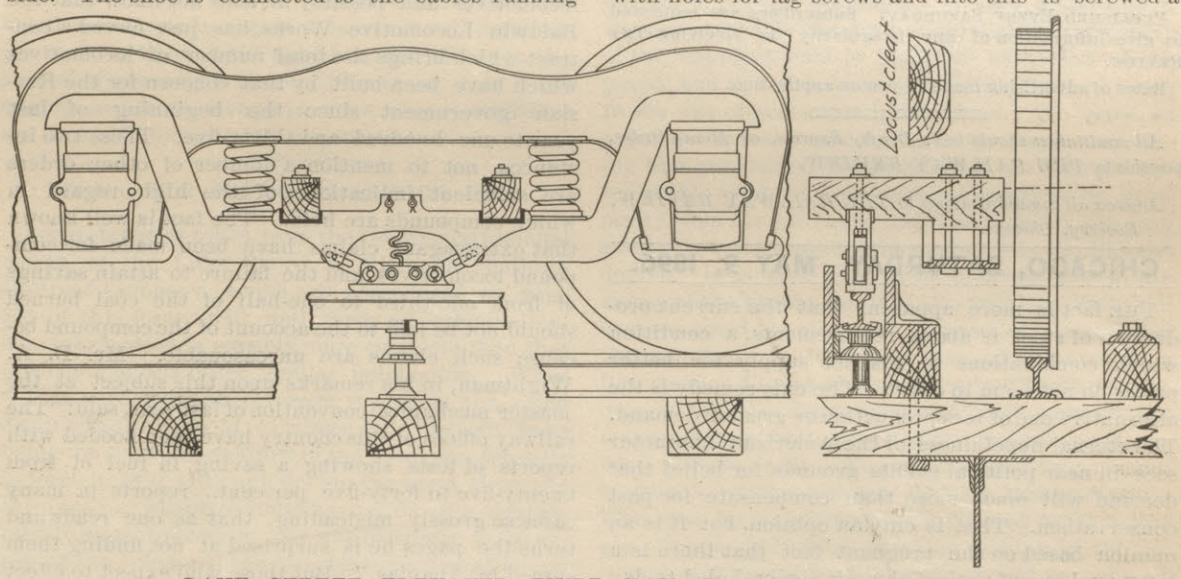
The contract for the construction and laying of the cables, as well as for the supply of all the station material and repairing machinery, was placed with Messrs. Siemens Bros. & Co. in July last. The engineers for the Amazon Telegraph Company are Messrs. Clark, Forde & Taylor, under whose supervision the cables have been made and laid.

The total length of the cables is 1,365 nautical miles, and almost the whole of this is main cable, there being no intermediate cable, and but little shore end and beach cable. The core consists of a single 7-strand conductor, insulated with gutta percha. For the main type of cable this core is served with jute, sheathed with twelve galvanized steel wires, and finished off with two layers of jute and compound. For the short lengths of beach cable, or perhaps it would be more appropriate in this instance to call it "bank cable," the core is taped, covered with a continuous cold-drawn lead tube, served with jute, sheathed with twenty-four steel wires and finished as usual. The short ends are made by applying to the beach cable a further sheathing of twelve steel wires again protected by jute and compound. The main cable measures nearly 1 in. in diameter, and weighs 56 cwt. per nautical mile; the beach cable ⅞ in., and 53 cwt.; and the shore end 1½ in., and 193 cwt. The distances from station to station being comparatively short, the working is carried on with Siemens' double current Morse instruments, with polarized relays.

Early in September last Mr. Alexander Siemens proceeded to Brazil and directed a careful survey of the Amazon from Para to Manaos, settling the route for the cable and selecting the most suitable landing places. The cable has been laid quite up to Manaos by the Faraday, to which the Malvern has acted as a tender. The Faraday, with Mr. Siemens in charge, sailed from the Thames in the middle of December last, and the first through message from Manaos was received in London February 10, this year.

THIRD RAIL SUPPORTS—LAKE STREET ELEVATED RAILROAD.

It is well known that the Lake Street Elevated Railroad of Chicago is now equipping its line for electric traction after having been operated as a steam road. The electrical construction is different from any which has been used before with the exception of the truck contact arrangement shown in Fig. 1. This illustration represents the brush attachment as applied to the equalizers of one of the McGuire trucks which were illustrated in the RAILWAY REVIEW of February 15, 1896. The brush consists of a shoe of cast iron supported by links which are slotted at their upper ends and carried by castings which are bolted to two pieces of maple about 4 x 4 in. in section which extend across the motor trucks carrying a contact device upon each side. The shoe is connected to the cables running



LAKE STREET ELEVATED THIRD RAIL—FIG. 1.—TRUCK ATTACHMENT.

to the motors by means of a short flexible conductor of number "0" conductivity which is shown in the illustration. The insulation of the shoes from the trucks is secured by means of the wooden bars which are treated for a number of hours in a bath of boiled oil for the exclusion of moisture. This arrangement is similar to that now in use on the Metropolitan Elevated Railroad of Chicago.

The third rail is a 48 lb. T section which is supported upon special insulators at intervals of about 6 ft. and just outside of the guard timbers which lie outside of the traffic rails. The location of these supports and the protection which is provided in the form of planks is clearly shown in the sectional view at the right of Fig. 1. The object of this protection is to prevent accidents to employes and also to guard against short circuiting the dynamos by means of the tools used about the structure which might otherwise come in contact with the live rail. The inside protection consists of a plank supported upon the guard timber by means of malleable iron brackets. The outside timber which is much wider is supported by locust cleats to which the guard timbers are screwed. The cleats are made dovetailed and fit in sockets of the cast iron rail supports which are made for the purpose.

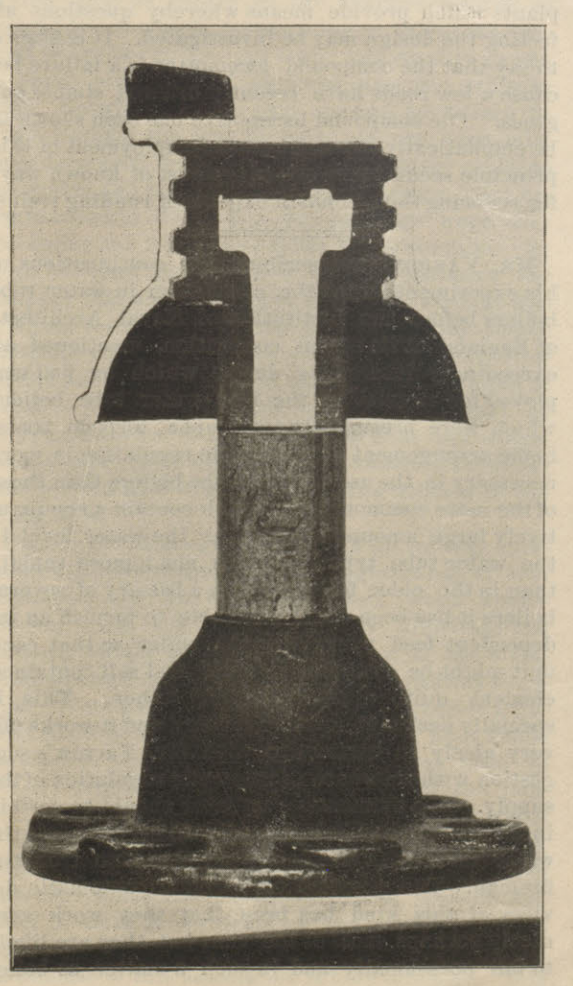


FIG. 2.—INSULATED SUPPORT.

The appearance of the support itself is shown in Fig. 2. This rail support is an insulator which was devised with special reference to obtaining freedom from leakage. It consists essentially of four parts which can be easily understood from a glance at the illustration which shows one of the supports, the upper portion of which has been sectioned to enable the construction to be seen. The base is a casting with holes for lag screws and into this is screwed a spindle which has formed upon it a cylinder of insulating material terminating at the top in an enlarged head which is fitted with a square screw thread by which it is turned into the top casting upon the platform of which the rail is held, by means of the lugs shown in Fig. 1. The rail is held in these lugs by twisting the insulator upon its base, there being sufficient space between the lugs in one position of the stand to admit of placing the rail upon the platform. The insulating material is called the "Etna" insulation and was furnished by Messrs A. and J. M. Anderson of Boston, Mass. It is extremely hard and has the appearance of being an excellent substance for the purpose.

Upon a test of five miles of the rail and including four miles of feeder cable it was found that with a 500 volt current the leakage amounted to about 0.16 of an ampere. The insulation of the third rail itself has been found to be as high as 17 megohns per mile. To show that this is an excellent insulation it should be stated that an electric light circuit is considered satisfactory with an insulation resistance of one megohn per mile. The platform supporting the rail is provided at its lower side with a petticoat for the purpose of preventing moisture from getting at the insulation In this respect the construction is similar to that of glass insulators for telegraph wires. To secure a perfect fit between the threaded portion of the insulator and the top casting, sulphur is used which may be seen in Fig. 2, which was taken direct from one of the supports.

This insulator was designed and patented by Mr. J. R. Chapman, electrical engineer in charge of the construction of the electric work on the Lake Street and Northwestern elevated roads. The insulator is much more expensive than others which have been used for similar purposes, but it is believed that the additional cost will be found advisable in view of decreased cost of maintenence and also from the reduction of the leakage to a minimum.

Plain and to the Point.

Mr. St. von Niementowski publishes in a recent number of the Journal fuer Praktische Chemie an account of his investigations of carboxethylorthoamidoparatoluylamide, of nitrometamthylorthouramidobenzoyl, of amidometamethylorthouramidobenzoyl, of dinitrormetamethlyorthouramidobenzoyl, of diamidometamethplorthouramidobenzoyl, of diamidometamethloythouramidobenzoyl, and of the diacetyldiamidometamethylorthouramidobenzoyl. Some of our readers may perhaps differ from Mr. von Niementowski, but in the main we think he is right. In fact, observes the Brooklyn Manufacturer, we have held the views, which he so well indicates, for some time past, but have not been able to express them so clearly and so concisely as he does.

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CHICAGO, SATURDAY, MAY 9, 1896.

THE fact is more apparent that the current production of steel is above requirements, a condition which combinations to restrict supply for better prices do not seem to effect. The only remedy is the alternative one of less production or greater demand. The eternal hopefulness of the American character sees in near political events grounds for belief that demand will much more than compensate for past conservatism. That is only an opinion, but it is an opinion based on the pregnant fact that there is a larger volume of projected work pigeon-holed to-day than we have ever had. The iron and steel makers are confident of enlarging requirements, but within a week prices have receded a notch. Plates and structural shapes are leading in activity. Rails are dull. Trolley line requirements are very active. Billets are weak. Consumers of coke and ore preserve an attitude of silent and defenseless hostility to $2.00 coke and $4.00 Bessemer ore.

THE remarks by Mr. S. F. Forbes of the Great Northern Railway upon the need of standards in railway supplies given elsewhere in this issue are worthy of more than passing notice. The subject is not a new one but is important from the fact that a great deal of unnecessary trouble is caused by the large variety of patterns or sizes of parts designed for the same purpose which are ordinarily used upon locomotives and cars. Many of the points mentioned by Mr. Forbes are well taken and there are several ways in which the stock of repair material may be largely reduced and without any sacrifice in other respects, by using standard sizes for all parts as far as possible. Stress has been laid upon the desirability of simplification of the matters of stacks and pilots to locomotives. The same idea may be easily carried out with regard to other parts such as cabs, fire doors, and draft gears and to a much greater extent than is usual in the matter of running gear and even boilers. At least one prominent road is now working upon this line in the design of fast passenger and freight locomotives in which the same boiler will be used for both. It is possible to hold to standards and old practice to an undesirable extent, but of this there is little danger on account of the number of real improvements which are so frequently offered. The standards which will show the greatest savings are those concerning small pieces and parts of which large numbers are used and which must be kept in stock at all important repair points on the road. It is these items in which one style may be as good as another which are likely to multiply without being noticed, that require the most attention and an excellent plan is followed in many shops of giving lists of the different sizes of material which are commonly held in stock to the men who have charge of the designing. They will then if designing a locomotive tank show two angle irons riveted together for stiffness in place of T irons, when the former are in stock and the latter are not, rather than cause the unnecessary expense of carrying T irons for this special purpose. This may be a homely illustration but it serves to point definitely to one of the small items many of which together form a large stock account which has occasioned the remarks of Mr. Forbes.

A WRITER who styles himself "Anti-Compound," in a recent communication to the *Railway Master Mechanic*, under the caption, "Some Questions About Compounds," implies that there is nothing whatever to be gained by compounding, and evidently bases his opinion upon the fact that some roads which have used compounds have ordered new engines recently which were not of that type. It would be more appropriate had he signed the remarks by the title "Simple." He is probably not aware of the fact that the Chicago, Milwaukee & St. Paul Railway has just received ten new compound locomotives and possibly he does not know that the Baldwin Locomotive Works has just closed a contract which brings the total number of locomotives which have been built by that concern for the Russian government since the beginning of last year to one hundred and thirty-five. These two instances, not to mention a number of other orders are sufficient indications of the high regard in which compounds are held. The fact is well known that extravagant claims have been made for compound locomotives, and the failure to attain savings of from one-third to one-half of the coal burned should not be laid to the account of the compound because such claims are unreasonable. Mr. D. A. Wightman, in his remarks upon this subject at the master mechanics' convention of last year, said: "The railway offices of this country have been flooded with reports of tests showing a saving in fuel of from twenty-five to forty-five per cent., reports in many cases so grossly misleading, that as one reads and turns the pages he is surprised at not finding them signed by Ananias." But those who expect to effect a saving of about fifteen per cent on fuel will not be disappointed if they purchase a well designed compound for this purpose. So far as is known there are no data published which will give the comparative cost of repairs of simple and compound locomotives, but by several officers who are using both types it is not considered that the compound is more expensive to maintain. The compound locomotive has come to stay. There have been some unsuccessful experiments with this type, but the principle has been shown to be correct and satisfactory, and instead of retrogression in this matter, improvements may be looked for which will probably place the compound upon a firmer footing than ever, as a consequence of the establishment of stationary locomotive testing plants which provide means whereby questions affecting the design may be investigated. It is absurd to say that the compound locomotive is a failure because a few roads have recently ordered simple engines. The compound locomotive has been shown to be emphatically a success and the employment of this principle seems to be one of the best of known ways for reducing the amount of expense of running trains.

MR. YARROW in describing the continuations of his experiments upon the circulation in water tube boilers before the Institution of Naval Architects of England at its recent convention, mentioned an exceedingly interesting device which he had employed for regulating the feed water tube boilers which were presumably used upon torpedo boats. Some arrangement for automatic regulation is more necessary in the use of water tube boilers than those of the more common types which contain a comparatively large amount of water as the water level in the water tube type fluctuates much more rapidly than in the older forms. With a battery of several boilers it has been found desirable to furnish an independent feed pump for each boiler so that each unit might be complete in itself and self contained element quite apart from any other. This is specially desirable upon ship board and it works out very nicely in connection with Mr. Yarrow's suggestion with reference to automatic regulation of the supply. The automatic regulator should be certain in its action and capable of taking care of the water level with absolutely no attention from the fireman. The greatest objection to automatic devices of this kind has been that they work very nicely perhaps most of the time but they are likely to fail occasionally and in such a matter as boiler feeding this result is likely to be highly dangerous. Mr. Yarrow carries the steam supply pipe which leads to the cylinders of the feed pumps, inside of the boiler to be fed and turns the end of the pipe downward through the steam space into the boiler to terminate in a point of the level at which the water is desired to be maintained. The pipe takes steam from the boiler whenever the surface of the water is below the orifice, but when the water covers the opening of the pipe, water instead of steam will work the pump. The idea is exceedingly ingenious and for a constant demand upon the boilers the steam pipe can probably be throttled so as to maintain a very nearly constant level. It is obvious however that barring accidents to the pump the level can never get below a safe point. The matter has not been carried beyond an experimental stage by Mr. Yarrow it having only been employed upon a boat with engines of three hundred horse power. It is said to work well and why would not such an arrangement be convenient in stationary plants? The operation of the pump by water pressure would of course be slow and while working in this way the water which would be taken from the boiler need not be lost and it need not lose its high temperature but could be run into a receiver and be pumped back again by the other side of the pump; the receiver taking care of the surplus of water removed from the boiler which is due to the difference in size of the steam and water cylinders of the pump.

ELSEWHERE in this issue under the caption of "Western Manufacturers and the Interstate Commerce Law" will be found a very surprising article which appeared as the leading editorial in a late issue of the *Iron Age*. For the reputation of that usually conservative and well conducted journal it is to be hoped that the editor was absent at the time of its appearance, but the article is nevertheless interesting as indicating the lack of understanding of the provisions and operations of the act to regulate commerce on the part of a great many people. The various evils which are assumed by the writer to be the result of the interstate commerce law are the ones that have been abolished by the law. To take an illustration from the line of trade in which our contemporary is directly interested, it may be said that since the act to regulate commerce became operative, it has not been possible, because of discrimination in rates, for a manufacturer of barbed wire to supply the farmers of the western states with its product in competition with manufacturers located in Illinois and Iowa as was the case before that time. As a matter of fact this particular commodity has been shipped from Worcester, Mass., to the Mississippi river at a less rate than was at the time in force from Joliet, Ill., to the same points. An instance is recalled where a buggy "knocked down and crated" was shipped from New York to St. Louis at a total cost of one dollar and nineteen cents; but we hardly think that even the writer in the *Iron Age* would defend such a proceeding in order that the New York manufacturer might enter the St. Louis market against his western competitor. The two serious errors into which the writer of the article in question has fallen are in assuming that it is the proper function of the railroads to equalize geographical and commercial conditions, and in supposing that transportation is a commodity to be bought and sold like other articles of trade. Railroading is a public service and as such must be of equal application. No particular class of persons can be singled out as entitled to special consideration so far as this service is concerned. If any manufacturer, by reason of superior location, facilities or enterprise, can produce his wares at a cost enough less to permit him to pay the extra rate of carriage necessary to enter the field of a distant competitor he is entitled to do so, but the railroads, which are under obligations to serve all alike, may not in justice reduce their charges for such a purpose. The supreme court in one of the decisions complained of struck the key note when it said that in the consideration of these questions the interests of the carrier and of the consumer were proper subjects for consideration. It may be objectionable to that class of piratical manufacturers who delight in invading the territory of those engaged in the same business to find that the interstate commerce law interposes a barrier to their tactics, but the sooner they learn that the act to reg-

ulate commerce proposes to do just what its name signifies, the better it will be for them.

CONDENSING ATTACHMENTS TO STATIONARY ENGINES.

Methods of applying condensers to steam engines built for high pressure service is occupying the attention of many engineers abroad and in this country, with particular reference to the conditions found in electric railway plants and in factory practice. The object is to obtain the benefit of the extra eleven or twelve pounds per square inch added to the mean effective pressure upon the piston, which may be added by partial vacuum. This amount of gain is a material addition to the power of an engine as the increase of pressure, which is, what the use of the condenser practically amounts to, exists through very nearly the entire stroke, and under ordinary conditions a net gain of power may be expected of about twenty-five per cent, and this should be accompanied by an improvement in economy of from fifteen to twenty per cent depending upon the amount of cost of operation of the air and circulating pumps. The added mean effective pressure is not all clean gain because of the subtraction which must be made for the works of the pumps, but this work is seldom sufficient to vitiate the saving to a material extent.

The practicability of applying condensers to stationary engines in localities where there is not a sufficient supply of cooling water to prevent the necessity of using it over and over again, has been shown by recent applications of water cooling apparatus to a number of steam plants which have been recently erected in this country at places remote from any extensive water supply. The amount of saving to be expected from the application of a condenser to a large engine is sufficient to warrant quite an expense in erecting a plant for cooling water, and several cases are known in which investigation has been made with a view of estimating the cost of the application of a surface condenser, and which were abandoned because of difficulty in obtaining water cheaply. The building of a water cooler, however, is so simple and inexpensive as to make it apparent that the advantage of the additional pressure may be obtained at any point where there is sufficient room for a pan or spinkler cooler, or for the erection of a rack of lumber arranged with a view of letting a draft of air blow through it and cooling the water through the effect of the evaporation of a part of it. Such a rack is so simple an affair as to place within the power of almost every steam user the ability to use the steam to much better advantage than can be had with the ordinary high pressure system.

In England evaporative coolers are coming into considerable use and in some cases the roofs of large buildings are employed for this purpose, in which case a pipe leads along the roof near the ridge pole and is perforated throughout its entire length so as to distribute the water in a thin film over the entire roof. There are various other methods of accomplishing the same result, some of which employ shallow pans and others allow the water to drip from points in timber frame work through the air and being collected again in troughs it is ready to be reconducted to the condenser for the purpose of condensing more of the exhaust steam. Of course a certain amount of the water is lost by evaporation but it has been found that this amount is not sufficient to seriously interfere with the economy of the arrangement.

It is obvious that with large shops at hand the cost of cooling the water would be very slight and after the installation of the necessary reservoir and piping, the only working expense would be that of handling the water by pumps. The roof arrangement would be very convenient in warm weather.

In the winter exhaust steam may be led through the steam heating coils of the shops after which it may be passed into the condenser, and even for cold weather the comparatively high temperature of the water coming from the condenser would prevent trouble from freezing. This idea of cooling apparatus is applicable to shop plants, and as it is likely to be worked out to a considerable extent in connection with electric railways and manufacturing establishments much will probably be learned in connection with these equipments in the near future.

Some interesting figures concerning a number of such cooling systems are given by Mr. W. G. Starkweather writing in *Cassier's*, from which it appears that there is a wide divergence among the individual plants as to the amount of cooling surface required per horse power when evaporative systems such as pools or pans are used. The conditions of climate have an important bearing upon the size of the plant and under ordinary conditions thirty square feet of pool surface were found to be ample for each indicated horsepower of engines of about five hundred horsepower. In the pan system the area may be reduced to twenty square feet per indicated horsepower. By using the spray system a basin about fifty by twenty feet is required for a four hundred horsepower engine. In cases where engines which are running on the high pressure system are found inadequate in regard to power it will certainly pay to investigate this question, and put upon the ground of economy it seems likely to pay even if the engines are large enough in cases where conditions are favorable for erecting the coolers.

SHALL OUR RAILROADS LIVE OR DIE?

Some statistics taken from the twenty-sixth annual report of the Lake Shore & Michigan Southern Railroad Company, which are reproduced on page 258 of this issue, will well repay an examination. The information is possibly more complete than that furnished by any other similar publication. What will at once strike the average reader is the rapid decline in the ratio of earnings, the present basis being only about one-third of the rate per ton-mile in force in 1870, although during the same time the earnings per passenger-mile have suffered a comparatively small reduction. As was naturally to be expected the volume of the passenger business although materially larger in 1895 than in 1870 (nearly twenty-five per cent) did not increase in anywhere near the same proportion as the freight traffic, that business having grown nearly five hundred per cent in the same period. Had the earning of the freight business been maintained in anything like the proportion of the passenger traffic, the stockholders of the Lake Shore road would have little cause to complain, but the figures show that although increasing its ton-miles nearly five hundred per cent, it was only able to increase its earnings a little more than fifty per cent.

Some other statistics given in the report are of equal interest but could not be reproduced for want of space. One of the most significant showings is that made in regard to the average loading of freight trains which, commencing in 1870 at one hundred thirty-seven tons per train, has steadily grown to three hundred and eighteen tons per train in 1895. Notwithstanding this marked advantage in train loading the freight earnings per train-mile have decreased from two dollars and three cents to one dollar and eighty-two cents, the lowest point being reached in 1885 when the earnings were only one dollar and forty-three cents per train-mile. By close economy and the most careful operation the company was able to carry to its income account this year a surplus of a little more than sixty thousand dollars after paying six per cent dividends. How careful and how economical must be the operation of a road to produce even this meager result may be appreciated when it is understood that the difference in earnings of twenty-five ten-thousandths of one cent per ton-mile would have put the balance on the wrong side.

No one not thoroughly familiar with railway operation will apprehend the full significance of this statement; nor, on the other hand, when apprehended, could any statement better illustrate the necessity for the absolute maintenance if not a material advance on the present basis of railway earnings. Were any justification needed, no better argument could be supplied in defense of the joint traffic association which in some quarters has been so roundly denounced as a scheme to defraud the public. It is probably fair to say that the average status of the roads comprised in that association is any better, if as good, as the Lake Shore, and yet men of high degree and low degree, in official position and out of it, unite in condemning the association as a high-handed outrage on the part of the railroads. No defense of this association is here intended. It is not believed that the association is of sufficient strength to warrant any long lease of life. It is at best only an expedient which will serve to bridge over the time until the people of the country shall have become sufficiently educated to permit the removal from the statute the prohibition which now prevents the railroads from fully carrying out the purposes of the act to regulate commerce. It is evident, however, that unless the universal bankruptcy of the railroads of this country is a thing to be desired some means are necessary to prevent the rapidly diminishing margin of profits from railroad operation from being altogether swept away.

It is high time that the press of this country abandoned their attitude of misrepresentation and opposition to railroads and made an effort to change the current of popular prejudice. A large proportion of the papers of this country believe that the prosperity of the manufacturers is identical with that of the people and that if necessary to maintenance, a bonus in the way of protection is due them. We have no argument to make concerning the principle underlying this proposition but submit that the manufacturers of the country are no more necessary to its prosperity than the railroads, and that to foster the one and to oppress the other is inconsistent in the highest degree. It is true that both interests are at the mercy of the people, but it is also true that while the country could get rid of the expense of maintaining the manufacturers by killing them off it cannot in a like manner dispose of the railroads. Their present owners may be dispossessed of their property but transportation must go on and the people must pay for it just the same. We can go abroad for our manufactured articles but not for our transportation. That must be maintained and supported by the people. Hence it is that anything looking to the destruction of the railroad interests should be opposed by the press as prejudicial to the best interests of the country, and if newspapers are wise they will give up their present attitude and advocate putting the largest industry of the nation on a self-sustaining basis.

FLANGED AND BULL-HEADED RAILS.

The relative merits of rails of the bull head and flange patterns have been frequently discussed, and yet the subject as presented in the letter by Mr. Jas. Whitestone, written some time ago to the London Engineer, which is given below, will doubtless prove interesting to readers upon this size of the water. Mr. Whitestone refers to a letter written by Mr. Tratman, in which the following remarks were made;

"Rails are intended for the rolling surface of a track construction and should not be considered as independent structures acting as bridge spans supported on piers," Mr. Whitestone goes on to say: I have never suggested that a rail is to be thus considered, nor even that it should be compared with a continuous bridge girder of several spans; and such a comparison would be fallacious because the alterations of levels due to subsidence of sleepers are altogether out of proportion—in relation to the spans—with any variations met with in bridge piers. But curiously enough, as it seems to me, some such assumption must be involved before we could regard the provision of a "rolling surface" as the main purpose of a rail.

If the supports were absolutely fixed in level, we might, by reducing the distances, increase the effective strength and stiffness of the rail indefinitely, so that, if the sleepers were placed close together, the rail would not require any appreciable stiffness, and need only be a wear-resisting strip. That such reasoning would be quite inapplicable to to a railway, is sufficiently evident from practice in the United States, where experience has dictated the use of the heaviest rails yet made, although they rest on sleepers spaced more closely than usual in any other country. My contention has been that stiffness for purpose of distributing a concentrated load over a considerable length of track and reducing vertical curvature, is one of the most essential functions of a rail. Deficiency in rail stiffness cannot be compensated by close sleepering, and this, I think, is shown in American practice by an unnecessary expenditure of material, owing to the section of rail adopted.

Of course, stiffness is a quality distinct from strength under static stress; the one depending upon the moment of inertia, and the other upon the moment of resistance of the section, and it is quite possible that with two rails of the same weight, one may have less strength but greater stiffness than the other. Under fast traffic, I suggest that with two rails of equal static resistance, the stiffer one would be effectively stronger owing to its greater radius of curvature under the advancing load, and that therefore important as adequate stiffness is in all cases, increasing speeds render it more especially so at the present time for the sake of both road and rolling stock. * * *

But to continue quotations: "As it would be useless to try and introduce the English type of track in those

countries where flange rails are already adopted, the only way to obtain an equally safe and strong road for heavy traffic as on the English lines seems to be to strengthen those by the adoption of the Goliath rail with the steel plates, but let every one keep to his section of rail."

This opinion of an engineer especially identified with the flange section may, I think, be accepted as strong confirmation of the views I have before expressed in your columns, but it goes one important step further. "It would be useless to try and introduce" a type, which by implication is admitted to be superior, because an inferior type was adopted at the outset. I submit that this has a very practical bearing in relation to Mr. Tratman's remarks regarding colonial development by cheap railways. When the future welfare of a growing country is kept in view, much may be said in favor of "building for posterity" as contrasted with hand-to-mouth expediency; and the engineer to whose lot it falls to initiate a type of permanent way which is likely to be permanent has in his control more far-reaching power for good or evil than may be generally supposed.

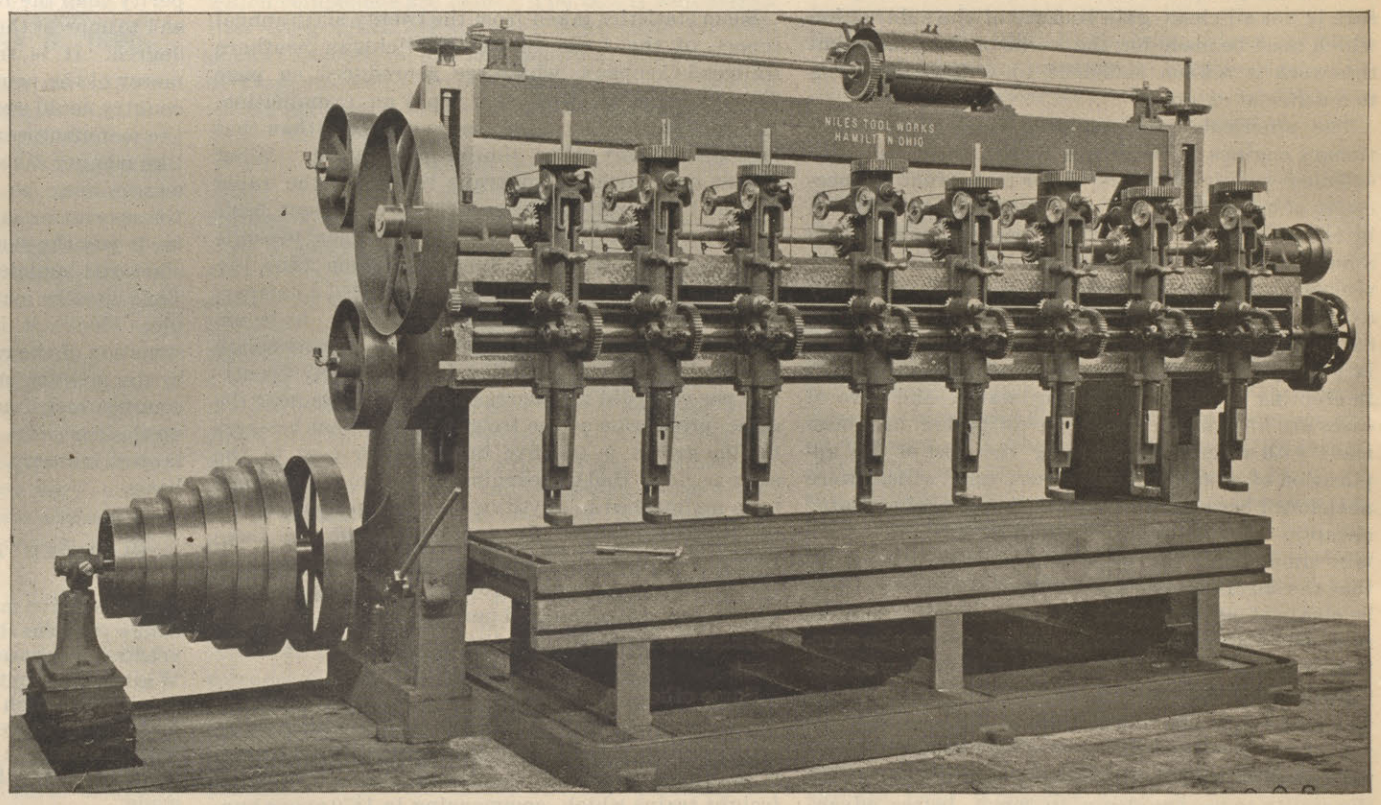
It is not the rail section only that is involved. In comparing American and English permanent way, the different types of locomotives used in the two countries should not be overlooked. With smaller wheels and shorter distances between their axles, an American locomotive is statically easier on the road, weight for weight, than an English one; the frame and spring serving to perform part of the duty thrown upon the rail here. This suggests the following rather curious coincidence. We find in the United States extremely heavy rails, sleepers placed at very short intervals, and locomotives with very short distances between their axles; and a possible cause for each one of these peculiarities might, by *a priori* reasoning, be found in adoption of a form of rail inherently deficient in stiffness.

That we owe much to the experience gained in the gradual development of American railways, I should be the first to admit, and the introduction of cars of American type on our roads proves that the Britisher is not hopelessly conservative, but such cars are more at home on the English than on the American track. That "the American track is probably more stable than the best English track, owing to the closer spacing of the ties and the more frequent fastenings," I do not believe, and I should prefer to say that the more frequent fastenings, and the ties to hold them, are rendered necessary by want of the stability afforded by the chairs used here. The running performances on English railways do not indicate any lack of stability, and, on the other hand, the various contrivances which have been tried for strutting up the heads of flange rails on curves, and the more recent tie plates and fang bolts used in the United States, do certainly point in that direction.

I am still of opinion that the track of the future will be found in bull head rails on steel sleepers, and that the economy to be secured in the long run by that system must eventually secure its adoption, not only in India and the colonies, but in this country and even in the United States.

MULTIPLE DRILL FOR GIRDER WORK.

The illustration herewith is reproduced from a photograph of a special multiple drill recently built by the Niles Tool Works Co., of Hamilton, O., for use on bridges, girders and structural work of all kinds where large numbers of holes must be drilled with duplicate spacing. The machine is heavy and has sufficient power for drilling eight 1½ inch holes at one time. Each spindle is counterweighted and may be adjusted independently along the rail for varying the distance between the holes to be drilled. After this adjustment has been made, however, all the spindles can be moved along the rail simultaneously by means of a separate screw, without varying the distance between centers of any of them. This makes a very convenient adjustment where numbers of holes must be drilled near together. Each spindle is provided with an automatic feed, and each is driven by a detachable gear and has three ranges of feed adaptable for drilling holes from ½ to 1½ in. in diameter. The cross rail is raised and lowered by power and has a range of from 32 in. up to 6 ft. from the sole plate. The work table is 24 in. above the floor, has a lateral movement of 30 in., and may be moved back of the spindles out of the way when it is desired to set high work on the sole plate. The vertical movement of each spindle is 12 in. The distance between the housings is 12 ft. The table is 42 in. wide. Each drill spindle has a guide bar for the lower end of the drill and both the rail and table are provided with convenient graduations for making adjustments. The workmanship and finish on all parts is of the highest class, and the machine is capable of turning out a large amount of accurate work.



MULTIPLE DRILL FOR GIRDER WORK—NILES TOOL WORKS.

NEW METHOD FOR DETERMINING THE SUPPORTING POWER OF PILES.*

It is often impossible to test bearing piles by the direct application of a sufficient load, and the supporting power can then be ascertained only by means of certain formulas, either rational or empirical. The most noticeable among the former are those of Redtenbacher and of Rankine. All the formulas hitherto proposed, however, are defective, and this deficiency is chiefly due to the following uncertainties:—

(1) The blow or concussion between the hammer and the pile is usually, for safety, supposed to be inelastic; but this is obviously not the case. The allowance, however, which should be made for the elasticity of the blow is unknown.

(2) It is not certain whether, as being compressed by the action of the blow, a length equal to the whole actual length of the pile or to some part of it only should be introduced. Redtenbacher in his formula inserts the whole, Rankine only one-half of the real length of pile.

(3) The weight of the timber of which the pile consists, and which is introduced into Redtenbacher's formula, varies for pine between 30 lbs. and 44 lbs. per cubic foot.

(4) The modulus of elasticity of pine may vary between 1,400,000 lbs. and 1,800,000 lbs. per square inch.

These formulas in consequence differ widely in their results. Other formulas in which the compressibility of the timber is neglected are to be condemned as being apt to lead to serious errors in all cases, unless the influence of the elasticity of the timber is inappreciable. This only occurs when a comparatively light pile is driven into soft ground by heavy blows. The empirical formulas are in most cases merely based upon conjecture rather than upon reliable observation, for the reason that the real supporting power of bearing piles cannot always be tested by the application of a sufficiently large dead load. On the most favorable assumption they will be approximately correct only for cases similar to the one from which they have been deduced, and their generalization will always be open to suspicion. They are therefore still less trustworthy than rational formulas.

The author proposes to show a new method, at once simple and reliable. The supporting power is generally required only when the pile has been already driven into the ground to a considerable depth, and sinks comparatively very little further after a certain number of subsequent blows or sets of blows. It may in that case be concluded that when the penetration of the pile after a blow has become very small in comparison to the total depth already attained, the increase of supporting power will be also small in comparison with the total supporting power it already possesses.

Now let W be the weight of the hammer and h the hight from which it falls, then gives—

$$E = W h \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

the energy of the blow or set of blows, as the case may be. This energy is spent in producing a number of different effect, which, however may be summed up in two classes, one of which represents the useful work, whilst the other comprises all that work which is of no use for the particular purpose, and which may therefore be regarded as lost. Let the former be expressed by U and the latter by V, then it is evident that—

$$E = U + V.$$

U only represents the work done in driving the pile against the resistance of the ground through a measurable distance or depth d; and this resistance of the ground to the penetration of the pile is the bearing power of the latter, L; therefore

$$E = Ld + V \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

The hammer only does useful work from the moment when the pile begins to move or as soon as

$$d > 0.$$

As long as d remains zero all the work done by the hammer is useless or lost. Let E_o be the energy necessary to balance the loss V at the limit when the pile will just begin to penetrate further; then

$$V = E_o$$

If now the value E_o be found beyond which the loss V cannot increase—because for any value of $E > E_o$ the resistance of the ground is overcome and the pile will penetrate, it follows directly from (2) that

$$L = \frac{E - E_o}{d} \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

It is true that E_o cannot be determined in a direct manner; but it may be deduced with sufficient accuracy from the result of two subsequent blows or sets of blows in the following manner: Make two consecutive and efficient sets of an equal number of blows, but of different energies, E_1 E_2; that is to say, in using the same hammer apply different hights, h_1, h_2. If the pile still advances considerably let the blows of the second set be the weaker; if the advance of the pile is small let the second set of blows be the heavier. Let d_1, d_2 be the depths through which the pile is driven by the action of the energies E_1, E_2, respectively; then, subject to the condition that d_1 as well as d_2 be sufficiently small in comparison with the whole depth already attained it may be assumed that L as well as V will remain sensibly constant in passing from the first set of blows to the second, so that from (2) it may be deduced

$$\frac{d\,(E)}{d\,(d)} = \text{constant, nearly.}$$

The law according to which E and d vary together may therefore in this case, and within the limits in question, be approximately represented by a straight line, inclined toward the rectangular axes of co-ordinates and intersecting one of them in the point corresponding to

$$d = 0,\ E = E_o;$$

so that

$$\frac{E_1 - E_o}{E_2 - E_o} = \frac{d_1}{d_2},$$

whence

$$E_o = \frac{E_2 d_1 - E_1 d_2}{d_1 - d_2} \text{ nearly} \quad . \quad . \quad . \quad (4)$$

If now in (3) and (4) the number of blows used in the testing set be cancelled, the equations may take the form

$$L = \frac{h - h_o}{D} \cdot W \quad . \quad . \quad . \quad . \quad . \quad (3a)$$

$$h_o = \frac{h_2 D_1 - h_1 D_2}{D_1 - D_2} \quad . \quad . \quad . \quad . \quad . \quad (4a)$$

where D is the average depth through which the pile is driven by one blow of the respective set of blows.

Since, for h and D in (3a), h or h_2, and D_1 or D_2 respectively, may be substituted, the bearing power of the pile may be finally expressed

$$L = \frac{h_1 - h_2}{D_1 - D_2} \cdot W \quad . \quad . \quad . \quad . \quad . \quad (5)$$

This method is more reliable than any other, dispensing as it does with all uncertain assumption and being merely

*A paper by Franz Krenter professor of civil engineering in the Royal Technical High School of Munich before the Institution of Civil Engineers.

founded upon observations in connection with the special case in question.

Preparatory to ascertaining the supporting power of piles by the method explained the following precautions are of great importance:

(1) The piles should rest for some time in order to allow the stresses produced in the ground by the penetration of the piles to be relieved. It has been stated from experience that piles frequently penetrate with renewed ease after some day's rest. An immediate test driving might therefore lead to erroneous results and to too high an estimate of the supporting power of the piles.

(2) The heads of the test piles should be sawn off to present a sound and solid surface to the blows of the hammer.

(3(The number and force of the testing set of blows should be such as not to crush the head of the pile.

NOTICES OF PUBLICATIONS.

A valuable catalog has been issued by the H. Channon Company of 24 and 26 Market street, Chicago, dealers in contractors' and railway supplies. This catalog is bound in cloth, 246 pages (not standard size), illustrated throughout. The chief divisions into which the descriptive matter naturally falls is construction material and tools of all kinds for carpenters, machinists, blacksmiths, boiler makers and men employed in handling earthwork. The variety is so large that it would be impossible to enumerate the different lines of goods in any other way. Special attention is given to supplies for the construction of railroads, including wire and manilla rope and fittings for both wooden and iron tackle and snatch blocks, hand powers, hoisting engines, capstans, derricks and windlasses and all of the tools which are commonly used in construction work, including drill presses, forges, belting, implements for handling boards and large sticks of timber. The last few pages of the book are given to illustrations and detailed descriptions of pumps and lanterns. A good index is provided, with which any of the items may be easily found. The catalog is convenient and gives what would appear to be all the necessary information which would be ordinarily required in ordering goods. It is to be commended for the absence of the customary amount of so-called "useful" but unreliable information, with which many catalogs of this character are burdened. The company states that in addition to the material required by railways and contractors, marine hardware, also tents, covers and awnings are manufactured by them. The company is well known and one of its principles is stated to be that in furnishing goods for contractors or any one doing heavy lifting the material used should be the best, as the breaking of a rope or block might result seriousiy, and on account of this the utmost care is given to send out at all times the best goods for the purpose ordered. This is such a catalog as will be wanted by superintendents or other officers in charge of construction work to order parts directly from the work.

HISTORY OF THE UNION PACIFIC RAILROAD—H. K. White, B. A.

The first chapter of this book gives in outline the evolution of the plan for building the first trans-continental railway. There is no attempt at fullness of treatment, the attention being confined to those points which are necessary to an understanding of subsequent developments. However accurate reference to the sources of the author's information make it easy for any reader who so desires to fill in this outline to any desired extent.

Then comes a short exposition of the chartering acts, written for the layman, not the lawyer. Evidently thinking that the reading of the later chapters might raise questions concerning the charters which this chapter would not answer, long citations from the laws have been put in the appendix and an abstract of the omitted portions of those laws.

The third chapter deals with the seemingly insuperable obstacles to be overcome in building the road, and the devices employed to overcome them. Here the exact nature of the Credit Mobelier is explained—a topic which has long waited for adequate treatment. Here too as throughout the book, the author has disarmed many critics by ample references to sources of information. The author's view of the Credit Moeblier scandal is the one always held by the most careful students of affairs, but not at all the popular view. It would prove a revelation to many well informed readers.

The building of the branch roads is next treated in a chapter which shows up some of the most picturesque incidents in the railway history of our country. One would wish that fuller treatment had been accorded them if they were not recognized as incidents, and so subordinate to the main object of the history.

Then comes the internal history of the Union Pacific, and the struggles of various railway magnates for control. How Gould outgeneraled the others and how the consolidation and reorganization of 1880 was effected, was explained. The causes of the decline in prosperity are pointed out chief among them being the building of the other trans-continental lines.

The next chapter abandons chronological treatment for the sake of showing how the attitude of the public has changed from too great enthusiasm for the road to an unjust bitterness against all connected with it. Here Mr. White lays himself open to the accusation of onesidedness by presenting the arguments in favor of the road far more fully than those against it. As the adverse criticisms are common property, perhaps he may be excused for this. Still his treatment is not strictly judicial.

Chapter seven is something unique in railway literature. First, all the significant facts contained in the financial reports of the road down to the end of 1894 were brought together in tables of figures. Then, because no one would read them, they were banished to the appendix, their place in the text being taken by a series of graphic illustration. These are exceedingly simple, making evident at a glance what would otherwise be learned only by a careful collating of many columns of figures. The explanations and comments which accompany them are concise and lucid, and need frighten none, no matter how little accustomed to the study of railway accounts. The Union Pacific is the only road whose financial history has ever been thus condensed and elucidated.

A short statement of the attempts at settling the vexing problem of the Pacific debts, and an opinion as to what lines must eventually be followed in the settlement, brings the book to a close.

Whether one accepts Mr. White's conclusions or not, one must admit that he has enumerated clearly the elements of the problem which will continue to confront congress until it is solved. He has told where he obtained his information, and where others can find proof or disproof of his statements. His book is an excellent guide to the study of the problem with which it deals.

Early in 1894 this paper noticed a book by John P. Davis, The Union Pacific Railway. The earlier book dealt almost exclusively with the political side of the history of the road, while the later one is distinctively an economical study. The former was marred by the presence of expressions of personal prejudices which are wholly absent from the latter. The two books, dealing as they do with distinctly different phases of the problem, finely supplement each other.

On the whole we feel justified in commending Mr. White's book to our readers Mr. Marvin Hughitt, president of the Northwestern Railway Company, says it is the best railway monograph extant.

TECHNICAL MEETINGS.

Annual convention Master Car Builders' Association, June 17, Saratoga, New York.

Association Railway Claim Agents, May 27, Monongahela House, Pittsburgh, Pa.

International Association Car Accountants, June 9, Cleveland, Ohio.

Annual convention American Master Mechanics' Association, June 22, Saratoga, New York.

Association American Railway Accounting Officers, May 27, New York City.

Association Railway Telegraph Superintendents, June 17, Fortress Monroe, Va.

American Association General Baggage Agents, July 15, Philadelphia, Pa.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p.m., at the House of the Society, 127 East Twenty-third street, New York City.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The International Irrigation Congress will hold its fourth session at Albuquerque, N. M., September 16-19. Fred L. Alles, secretary, Los Angeles, Cal.; local secretary, W. C. Hadley, E M., Albuquerque, N. M.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each mouth, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Tuesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Thursday in each month, at 8 p. m., at 12 West hirty-first street, Ne w York City.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Railway Signaling Club holds its meetings in Chicago, Ill., on the second Tuesday of January, March, May, September and November. G. M. Basford, secretary, 818 The Rookery.

The Southwestern Society of Mining Engineers will hold a session at Albuquerque, N. M., September 16-19. Walter C. Hadley, secretary, Albuquerque, N. M.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Central Railway Club meets on the fourth Wednesday of January, March, April, September and October, at 10 a. m., at the Hotel Iroquois, Buffalo, N. Y.

The Western Foundrymen's Association holds its meetings on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, S. T. Johnston, 1522 Monadnock building.

The Technical Society of the Pacific Coast has a month y meeting on the first Friday in each month at 8 p. m., at the Academy of Sciences building, 819 Market street, San Francisco, Cal.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at the Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1122 Girard street, Philadelphia, Pa.

PERSONAL.

Mr. Thomas J. Klase, eastern freight agent of the Lehigh Valley, has had his headquarters changed from New York to Boston, Mass.

Mr. Jere Whitcomb, late agent of the Nickel Plate fast freight line at St. Louis, is to be given a position in the office of the Erie lines.

Mr. E. T. Collins, a trainmaster of the Santa Fe lines, has resigned, and June 1 will go to Mexico to take an important position on the Mexican Central.

Mr. C. H. Holdridge, has been appointed commercial agent of the Seaboard Air Line at Pittsburgh. This is the first time the road has had a representative at that point.

Mr. W. N. Mitchell has been appointed commercial freight agent of the Baltimore & Ohio R., with headquarters at Atlanta, Ga. The change was effective on May 1.

Mr. M. Gilleas has been appointed assistant general manager of the Chesapeake & Ohio Southwestern at Memphis. He was formerly connected with the Illinois Central.

Mr. Renne P. Granger, chief clerk in Manager W. G. VanVlecke's office, has been appointed master of transportation of the entire Atlantic system of the Southern Pacific, effective at once.

Mr. Stuart A. Allen, who has been appointed contracting and traveling agent of the Blue and Canada Southern fast freight lines for the Cincinnati territory, has assumed the duties of the office.

The board of directors of the Chicago, Peoria & St. Louis R. have elected Mr. F. W. Heidekeper, of New York, president of the railroad, vice Mr. Henry W Putnam, of New York.

Mr. J. N. Kalbaugh, master mechanic of the Pittsburgh division of the Baltimore & Ohio has been appointed division superintendent of motive power, succeeding Mr A. J. Cromwell, resigned.

An official circular announces the appointment of Mr. Lucas Van Allen to be superintendent of the Buffalo division of the Lehigh Valley, vice Mr. Chas. A. Beach, who resigned some time ago.

Mr. H. G. Kelley has been promoted to chief engineer of the St. Louis & Southwestern. Mr. Kelley was at one time connected with the maintenance of way department of the Indiana, Bloomington & Western.

Mr. H. E. Du Bois, who has been with the Canada Southern, has assumed the duties of traveling freight agent of the Grand Trunk road and National Dispatch. His headquarters are in Cincinnati.

Mr. W. K. Thompson, assistant superintendent of the Canadian Pacific, has been transferred to the Atlantic division. Mr. T. Williams has been appointed in his place and will have charge of the lines west of Toronto.

Mr. Peter P. Shelby, assistant general traffic manager of the Great Northern, with headquarters at Seattle, Wash., has resigned. The resignation was caused by ill health. His successor has not yet been determined upon.

Mr. Charles L. Brown of New York, general freight agent of the Lexington divisison, Chesapeake & Ohio, and general freight agent of the Kentucky Central, aged 26 years, died at Lexington, Ky., on the night of May 5, the result of an accident.

Mr. J. H. Reed has resigned the vice presidency of the Pittsburgh & Lake Erie R. Co., the chairmanship of the board of directors of Pittsburgh, McKeesport & Youngstown R., and will hereafter be indentified with the Carnegie railroad interests.

Mr. S. H. Wendt has been appointed chief accountant of the Nickel Plate, vice Mr. P. E. Nolan, resigned. Mr. Wendt has been identified with the Erie fast freight lines for a number of years. He was at one time private secretary of Jay Gould, and also of the late James H. Rutter.

Mr. N. B. Kelley has been appointed commissioner of the Philadelphia Freight Bureau Trade League, succeeding Mr. C. P. Hatch, who was appointed commissioner of the Southern Railroad Association. Mr. Kelly has for some years been with the Erie & Western Transportation Co.

Mr. E. L. Weisgerber, for 22 years master mechanic of the Baltimore & Ohio at Newark, Ohio, has just been appointed master mechanic at the Mt. Clare shops and left for his new post Wednesday. Mr. Weisgerber will be succeeded by Mr. Wm. Harrison, Jr., at present general foreman.

Mr. M. T. Wright, trainmaster of the western division of the Michigan Central, has succeeded Mr- J. C. Lee, recently resigned, as superintendent of the western division of the Michigan Central, with headquarters at Michigan City, Ind. Mr. Lee had held this position for 16 years.

Mr. Charles E. Owen, traveling passenger agent for the past eight or ten years, of the Vandalia and Pennsylvania lines at Kansas City, has resigned to take charge of the Hotel Vendome at Leadville, Col. His successor will be Mr. J. T. Foley, city passenger and ticket agent at Terre Haute.

Mr. George W. Hommell, until recently superintendent of the Milwaukee Street Railway Company, has been engaged, according to report, to act as superintendent of the new Milwaukee-Waukesha Electric Railway Company. Mr. Hommell will have charge of the construction and equipment of the line.

The official circular has been issued announcing the appointment of Walter Nichols general agent for the Big Four at St. Louis. Mr. Nichols was for a number of years chief clerk of the Cincinnati, Jackson & Mackinaw, general freight office at Toledo, Ohio. He began railroading in the Vandalia division freight office at Indianapolis.

Mr. W. H. Reed, who recently resigned the position of commercial agent for the Wabash in Kansas City, after 16 years of service, has been appointed general traveling freight agent for the Chicago & Alton Railway, with headquarters in Kansas City. Mr. Reed was connected with the freight department of the Alton from 1870 to 1880.

Mr. John H. Milliken, who for two years past has been both district and city passenger agent of the Louisville & Nashville at Louisville, is now to have only the title of district passenger agent and will devote his whole time to his territory, which has been considerably enlarged. Mr. Wm. E. Bryan has been promoted to city ticket agent.

Mr. H. S. Burgesser, division freight agent of the West Shore at Buffalo, has been promoted to be assistant general freight agent of the same road. He will be located at New York. Mr. William A. Wilson, division freight agent at Toronto, will succeed Mr. Burgesser, and contracting agent Joseph Hickson will succeed Mr. Wilson.

Mr. A. S. Dodge, having resigned as general traffic manager of the Cotton Belt, to take service as a member of the board of administration of the Southwestern Traffic Association, that office is hereby abolished. Mr. R. S. Davis has been appointed general freight agent of the Cotton Belt. Passenger traffic will be looked after by Mr. F. W. LaBaume.

Mr. S. H. Dare, formerly contracting agent in Jacksonville, Fla., for the Nashville, Chattanooga & St. Louis R., has been appointed contracting agent of the Plant System, with headquarters in New York. Mr. Dare takes the place of Mr. B.F. Blake, who has been transferred to Boston where he will hold a similar position with the Plant System.

Mr. William Garstang, superintendent of motive power of the Big Four, has appointed Mr. Frank J. Zerbee master mechanic at the Wabash shops. Mr. Zerbee, who was foreman at the Bellefontaine shops, succeeds Mr. C. H. Doebler at Wabash. Mr. W. A. Bell has been appointed master mechanic of the Louisville division, with headquarters at Louisville.

According to official circular the duties of general manager of the Louisville, Evansville & St. Louis Consolidated have been assumed by Mr. George T. Jarvis, recently appointed receiver of that road. Mr. C. W. McGuire has been appointed auditor and Mr. W. L. Taylor has been made the general attorney. All other officers, agents and employes are continued in their respective positions.

A circular has been issued by the Great Northern officials announcing the appointment of Mr. H. A. Kimball as general agent of the freight department at Minneapolis of the Great Northern and the Eastern Minnesota Railways. This appointment will take effect immediately. Mr. Kimball was formerly connected with the Soo in a similar capacity in Minneapolis. He succeeds Mr. C. H. Russell, who resigned recently.

The office of general freight and passenger agent of the Ohio Southern, made vacant by the recent resignation of Mr. Rush L. Brockenbrough, mention of which was made last week, will be filled by Mr. F. E. Fisher, brother of Mr. W. H. Fisher, of the Hocking Valley, at Columbus, as general passenger agent, and by Mr. C. A. Barnard, now general agent at Jackson for the Ohio Southern, as general freight agent.

Mr. Frank G. Maus has been made general agent at Erie of the consolidated ore, coal and city freight business of the Pennsylvania R. Co. Mr. Maus has been the city agent for 10 years and Mr. Richard O'Brien, the ore and coal dock agent who retires from the service of the company, has had charge of the ore and coal business at Erie for 30 years, in addition to representing Scott & Co. Mr. S. E. Kennedy has taken charge of the Erie & Pittsburgh yard in place of Mr. Isaac McDonald, transferred.

Mr. John C. Robinson, general agent of the Duluth Union Depot Co., formerly for eighteen years an employe of the Northern Pacific in this city, died this week at his home in Duluth, of appendicitis. While with the Northern Pacific, Mr. Robinson acted in the capacity of cashier of the general freight department, and later as general agent at Moorhead. He went from Moorhead to Duluth and became the local agent of that road at Duluth, resigning that position to accept the one he had when he died.

Mr. Taro Adrachi, general traffic manager, and Mr. S. Mimura, civil engineer, engineer of the Nippon Tetsudo Kivaisha Railway, of Japan, are making a tour through this country for the purpose of inspecting our railways. They landed at Vancouver, and from there went to San Francisco, and came to Chicago over the Union Pacific and Chicago & Northwestern, stopping at several points on the way. They visited the Illinois Steel Company's South Chicago plant and other manufactures about Chicago, and will spend two or three weeks about New York, Philadelphia and Pittsburgh.

Mr. Cornelius S. Bushnell, who held an extended reputation through his connection with Mr. John Ericsson, the inventor, died at New York City on May 6, from heart failure superinduced by an attack of the grip. Mr. Bushnell furnished funds for the building of Mr. Ericsson's famous Monitor, and also a large portion of the funds for building the Union Pacific R. and was one of the road's first directors. He also furnished the necessary money to build the war ship Destroyer, which was afterward sold to the Brazilian government. Mr. Bushnell was 67 years of age and had made and lost several fortunes.

A dispatch from New York City says: "Mr. J. D. Layng has been elected second vice president of the West Shore Railroad, in addition to the office of general manager, which he has held for several years. A circular recently issued by President Chauncey M. Depew announces that Mr. Layng will now have full charge of operating the road for the lessee (the New York Central). Mr. Layng, it may be said, has had practical charge of the West Shore ever since it was completed. He is also the second vice president of the Big Four system, and has long stood in the front rank of the distinguished railroad men in this country."

Some further changes are announced by the management of the Grand Trunk, all in the direction of centralizing the management of the entire system at Montreal. Car Accountant F. C. Vogel, who had his office at Detroit, has been transferred to Montreal. Chief Clerk Barrison, who was with the Chicago & Grand Trunk, with an office at Detroit, has also been transferred to Montreal, and will take a portion of his staff with him. Mr. W. H. Spencer, traveling car agent, and son of the former general manager of the Chicago & Grand Trunk, also goes to Montreal. Mr. T. D. Sheridan, who represented the Grand Trunk in Buffalo for over 30 years, retired May 1. He will be succeeded by Mr. James D. McDonald. Mr. John Taylor, general storekeeper of the Grand Trunk, left that road on the first of May, being entitled to a place on the superannuated list. Mr. Butze of the Wabash, is Mr. Taylor's successor, with the title of general purchasing agent.

At the annual meeting of the stockholders of the Mexican Central Railroad Co., limited, held in Boston on the 6th of this month, the following directors were elected: Charles A. Browne, of Boston; Isaac T. Burr, of Boston; Sebastian Camacho, of Mexico; Jacob Edwards, of Boston; Levi Z. Leiter, of Chicago; Frank P. McIntyre, of Boston; Pablo Martinez Del Rio, of Mexico; E. Rollins Morse, of Boston; Hiram R. Nickerson, of Mexico; Charles J. Paine, of Boston; Charles E. Perkins, of Burlington, Ia.; Joseph Richardson, of New York; Albert A. Robinson, of Topeka, Kas.; Alden Speare, of Boston; Robert R. Symon, of London, Eng.; Joseph H. White, of Boston; George B. Wilbur, of Boston. The board of directors then organized by the election of officers as follows: A. A. Robinson, president; Robt. R. Symon, vice president; E. Rollins Morse, vice president and chairman finance committee; J. T. Harmer, clerk and comptroller: C. A. Brown, treasurer and transportation agent; H. R. Nickerson, general manager; W.A. Frost, auditor; Jay A. Hendry, assistant treasurer.

RAILWAY NEWS.

Atchison, Topeka & Santa Fe.—The people of Wichita county, Kansas, will appeal to the state board of railroad commissioners to compel the Santa Fe Co. to operate its line from Leoti to Selkirk, abandoned last week. The people voted bonds for the road, and unless the line is operated to Selkirk, threats of destruction of track already made may be executed. It is said that the Santa Fe moved all its property out of the county last Sunday to prevent service by the sheriff.

Denison & Northern.—Work on the Denison & Northern R. has been resumed and it is generally believed that it will be built at once into Denison. It is said that both the whites and Indians are very anxious for the road to be built to Denison to provide another outlet. The route laid out for this road is from Dougherty east to Coalgate, I. T., and from Pennington, a point on this line, south to Denison, Texas, a total distance of 104 miles. As previously stated in this column, receivers' certificates have been issued to the amount of $11,000 per mile, payable Jan. 1, 1897.

Duluth & Winnipeg.—Another postponement of the sale of the Duluth & Winnipeg road places the date at May 11. This was the second continuance granted by Judge Nelson. The first was granted last week and provided for a continuance until further order of the court. That was objected to, and upon motion the court changed the order as indicated. On the day mentioned Master Commissioner Edward Simonton will sell the Duluth & Winnipeg to the highest bidder at the steps of the government building in St. Paul, Minn.

Illinois Central.—During the past week a number of the daily papers have contained articles to the effect that the Illinois Central was to assume control of the Chesapeake, Ohio & Southwestern on June 1, and that the present equipment of that road was to be immediately re-lettered, putting the name of the Illinois Central on it. In speaking of this a prominent of official of that company says: "The Illinois Central will not assume control of the Chesapeake, Ohio & Southwestern on the 1st of June. The time of assuming the absolute control of this road is a matter of some uncertainty, depending upon matters pending in court and over which this company has no control. I don't for one moment imagine that we will operate that line of road under the name of the Illinois Central and with Illinois Central equipment, except so far as it may be desirable to help out traffic arrangements with Illinois Central equipment when it becomes necessary. Neither is it at all likely that the present equipment of the Chesapeake, Ohio & Southwestern road will be re-lettered, but there is no question that anything which will tend to insure unity of interests between the two lines will be established at the earliest possible moment and everything will be done which will enable the two lines to control such traffic as may fairly come within their scope."

Kansas City, Pittsburg & Gulf.—The Kansas City, Pittsburg & Gulf road is now in operation from Kansas City, Mo., to Salislaw, Indian Territory, 291 miles. A gap of about 100 miles, extending to Horatio, Ark., is under construction. From Horatio to Shreveport, La., 120 miles, the line is completed and in operation. The first train passed over the new bridge across the Arkansas river at Redland, I. T. on April 23. The road will be extended from Shreveport to Port Arthur, 201 miles. The entire line from Kansas City to Port Arthur will be 765 miles and it is expected to be finished this year.

Lake Shore & Michigan Southern.—From time to time the advisability of running a new line which will avoid the river and yards at Toledo, has been talked up, but officials have always declared the scheme impracticable as the proposed new line would cross so many roads, which would require so many interlockings that the Lake Shore could not make as fast time over the proposed line as it can over its present line. A report is again current, however, that this road will put a surveying party into the field which will run two lines, one to Wauseon, the other via Napoleon to Butler. The most feasible will be selected to make connections for the fast New York and Chicago trains. It would seem that the most important objection to the scheme is the connection the Lake Shore would miss by not going into Toledo.

Lima Northern.—The track of the Lima Northern R. was completed to Napoleon, Ohio, a distance of 49.4 miles north of Lima late on the night of April 30, and connections were made the next day with the Wabash, for the purpose of running trains into Toledo. A special train carrying officials arrived during the afternoon of that day and stayed until the road was completed, after which they returned to Lima. Grading is completed from Napoleon to Wauseon, a distance of 11 miles.

Michigan Central.—The annual report of the Michigan Central, which was issued May 5, shows gross earnings from traffic of $13,651,421, an increase of $1,067,407 over last year. The freight earnings were $9,177,964, an increase of $863,938. The passenger earnings were $3,672,501, an increase of $273,100. The gross operating expenses of the road were $10,183,231, an increase of $1,039,123. The total net revenue of the road was $810,350, out of which amount was paid $749,520 for dividends.

Nashville & Knoxville.—At a meeting of the stockholders of the Nashville & Chattanooga road, held recently at Lebanon, Tenn., the directors were authorized to issue bonds on the entire bed at $15,000 per mile, buy new rolling stock and to build the road from Lebanon into Nashville and complete the road from Monterey to the Cincinnati Southern. The road is now in operation from Lebanon to Monterey, a distance of 79 miles.

Philadelphia & Reading. — On Sunday last the southbound track of the Philadelphia & Reading road was shifted into position on a new roadbed for a distance of 300 yards, in order to eliminate a dangerous curve, known as Jones' Ledge, just above West Manayunk station on the main line, and this without disturbing the traffic of the road. Along the steep hillside the company is now building substantial walls to protect private property. Between twilight on Saturday and Sunday morning next the north-bound track will be placed in its new position. During the six years in which the company has been working there with this end in view, many thousand tons of rock have been removed by Contractor Ryan without cost to the company except the hauling.

Port Arthur, Duluth & Western.—According to reports, persons who have recently visited the north shore and Lake Superior state that in construction, location, maintenance, operation and management, the Port Arthur, Duluth & Western R. is without an equal. When the building of the road began it was intended to have it connect with an American line and form a through rail route from Port Arthur to Duluth, while the main line was extended to Rainy Lake and Lake of the Woods, and if the subsidies which were granted by the Canadian parliament to the amount of several thousand dollars per each constructed mile had held out long enough, the road would undoubtedly have been finished as projected. But the subsidies were exhausted all too soon and the contractors were not inclined to put the profits from the construction of the first half into the remainder. Seventy miles of road were built and the boomers of the road won an enviable distinction in constructing that much. It is said that the embankments were built up of logs and brush and that all the debris of the slovenly cleared right of way was concealed by a sprinkling of earth. The cuts were roughly gouged out of rock and earth and were never within a foot of the depth demanded by the grade. The bridges, instead of being supported on trestles, were placed on supports made of cribs of timber, piled up to the required hight. The rails, which were probably worn out before they were turned over to this company, are laid on ties which ought to be twice as numerous as they are. It is probably the only railway in the world that neither owns nor leases rolling stock. Since the road has been finished, it has been in the habit of borrowing a flat car, caboose and engine from the Canadian Pacific R. once a week. This limited train takes a day run from Port Arthur to

Gun Flint Lake and another day to get back. When it arrives at the lake it is welcomed by the entire population, which consists of three persons, who live by trapping and hunting in the streets of the future metropolis, and it is doubtful if there are 50 people along the entire line. On the American side of the line the road has a four mile extension to the Gun Flint Lake iron mine, which is owned in Minneapolis- At one place on this spur the woodwork of a bridge over a deep ravinc has burned, leaving the rails hanging across the chasm, forming a useless suspension bridge. The roadbed of the main line wends its irregular way through an uninhabitable country—a vast stretch of swamp and barren land covered with a dense growth of spruce, tamarack and balsam—until it reaches the terminus at Gun Flint Lake. Some day this road may be useful to commerce, but at present, as the "limited" rattles over the rusty rails and flimsy roadbed, it serves only to haul salt pork and beans to the three inhabitants of the terminus.

NEW ROADS AND PROJECTS.

Alabama.—Articles of incorporation for the Chattanooga & Gulf road have been filed at Montgomery, Ala., to build a railway from St. Marks, Fla., via Columbus, Ozark, Union Springs and Tuskegee, Ala., to Chattanooga, Tenn. The incorporators are T. M. Rushing, T. Gardner Foster, Gordon McDonald, A. T. Dreyspring, J. G. Winter, S. B. Matthews and A. B. Garland. A commission to open subscription books was issued to T. Gardner Foster, T. M. Rushing and S. B. Matthews. Capital stock, $100,000.

China.—A copy of the imperial decree has been sent to the department of state through Viceroy Chang Chi-Tung by United States Minister Denby, looking to the construction of a railway from Shanghai to Swatow, sixty-five miles. By the terms of the decree one-half of the required 2,000,000 taels (approximately $950,000) are to be furnished by the Chinese government and the remainder is to be supplied by subscription of the local merchants, and under no conditions may any foreign capital be received directly or indirectly.

Illinois.—Articles of incorporation have been filed with the Illinois secretary of state for the organization of a new road to be built and operated from a point at or near Madison, through Collinsville, to a point near O'Fallon, and from Collinsville to Lebanon, and from Collinsville to Peters Station. The name of the new organization is to be the St. Louis & Illinois R. Co., and the principal offices will be located at Collinsville. Capital stock $100,000.

Iowa.—Articles of incorporation have been filed at Council Bluffs, Iowa, for the. Western Construction Co., the object of which is to construct public and private work and own shares of capital railway stock and operate railways. The incorporators are F. C. Crowley, Geo. W. Wilson and James S. Demming. The headquarters of the company will be at Council Bluffs, and the capital stock $1,500,000, with privilege of increasing to $2,000,000.

Louisiana.—A corps of surveyors it is said, is to be put into the field in the interests of the New Orleans & Western road to lay out a line equi-distant between the Texas & Pacific and Southern Pacific, crossing the Texas line somewhere between Shreveport and Sabine. This line will be known as the western extension of the above road in accordance with its charter, which provided for a Texas division and will penetrate a country rich in lumber and agricultural products.

New York.—The Pecksport Connecting R. Co. has been incorporated in New York to build and operate a steam railroad four miles long from Pecksport, Madison county, on the line of the New York, Ontario & Western and known as the Utica branch, to Morrisville, on the main line of the same railroad. The directors of the new line are: J. E. Childs, J. C. Anderson, R. D. Rickard, A. L. Parmelee, J. M. Fleming, J. M. Shedd, C. A. Draper and H. Munzie of New York and George Marsden of Middletown. Capital stock, $40,000.

Ohio.—A route for a new line called the Cincinnati, Hillsboro & Jackson R. has been surveyed from Cincinnati to California in Pike county, and most of the right of way has been donated by land owners along the line. The road is to extend from Cincinnati to Jackson, a distance of 125 miles, and passing through the counties of Hamilton, Clermont, Brown, Highland, Pike and Jackson. The road was originally projected by a party of Hillsboro capitalists, who intended to build a freight road from Hillsboro to Jackson in order to get at the mineral deposits of this county, but after a little time, Cincinnati capitalists became interested and suggested an extension of the road from Hillsboro to Cincinnati, in which case they would then aid the project with influence and capital. From California the line will take what is known as the Mabees route, about 50 per cent of the right of way having been donated. The money behind the project is to be furnished by capitalists from Cincinnati, Hillsboro & Jackson. Hon. Harvey Wells, the founder of Wellston and the projector of the Wellston & Jackson Belt R., is one of the principal men engaged in the scheme.

Pennsylvania.—On May 1 a committee representing Philadelphia capitalists including, it is said, Messrs. W. H. Metcalf, H. C. Breese, G. F. McRae, Edward Fell Lukens and Irvin Hall, met representative men of Monroe county to discuss the building of the Delaware Valley Electric Railway from Stroudsburg to Port Jervis, a distance of 42 miles. The meeting proved favorable to the building of the road. The new company was organized about four weeks ago with J. Simpson Africa as president and Herbert W. Johnson, of Philadelphia, vice president. The treasurer is Senator John C. Grady.

The time limit on the contract for the first 25 miles of the Pittsburgh, Monongahela & Wheeling, which was awarded to Joseph Giannini last October, has expired, and as no work has been done, he has forfeited his right, and a new contract must now be awarded. The section begins on the eastern side of the Monongahela river, opposite Monongahela City, and crosses the river, extending to Clarkstown, in Washington county. Bids have been received and are now in the hands of the company. Wm. G. Dacey, of New York, is president, and J. H. McCreery, of Pittsburgh, general counsel.

The Etna & Montrose R. Co. has been incorporated at Harrisburg to build a line 6 miles in length from the mouth of Pine Creek, Allegheny county, to Montrose in Susquehanna county. The directors of the company are Hugh Kennedy, Sharpsburg, and Geo. B. Painter, Allegheny, and Mr. G. A. Chalfaut, of Etna, is president. Capital stock, $60,000.

South Carolina.—The extension to the Carolina Midland to Batesburg and thence to Greenwood, which was predicted at the time of the sale of the road in January, is an assured fact, and the contract has been let to W. B. Strang & Co., of 15 Wall street, New York City. The extension already contracted for will be 66 miles long, and it is to be completed to Batesburg in 90 days, and to Greenwood in 150 days. The chief object of the extension is to secure good Western connections, and at Greenwood connection will be made with the Southern, the Seaboard Air Line and the Port Royal & Western Carolina roads. The grading machinery has already been shipped to South Carolina, and work on the line will begin early in May. The present terminus of the Carolina Midland is at Seivern, in Aiken county.

South Dakota.—Dispatches from Yankton, S. D., state that information received there from England, indicates that the syndicate of creditors of Mr. J. T. M. Pierce, the Englishman was absconded after floating $4,000,000 worth of forged school bonds 18 months ago, will at once complete his undeveloped projects in this vicinity. Among these are the Yankton & Norfolk R. and a bridge across the Missouri river at Yankton. The contract has been awarded for the bridge, which is to cost $700,000. It is said that an agent of the English creditors has announced the early completion of both bridge and railroad, and is authority for the statement that an arrangement has beem made whereby this road and bridge will become the property of the Great Northern, and be an extension of the line from Yankton south.

Tennessee.—The construction of a new railroad from Humboldt to Mury City via Alamo, Crockett county, Tenn., which was agitated to quite an extent last year is again being talked up, and it is said that things are now assuming such shape that it is thought the line will be built this year. This road will develop one of the finest sections of the country in West Tennessee. There are thousands of bushels of corn in that locality that cannot be marketed on account of the long distance from a railroad.

Texas.—At a meeting of the directors of the projected Chicago, Weatherford & Brazos Valley R., held April 30, it was decided to apply for a charter at once. Surveys are already being made between Weatherford and Bridgeport, a distance of 32 miles, and the subscription list has been completed, the necessary amount having been raised. Mr. Henry Warren, of Weatherford, is president.

Reports from Georgetown, Texas, state that iron for the Georgetown & Granger section of the Link Line road, will be on the ground ready for work to begin in 15 days. As the grade is all completed, in first-class condition, the completion of the line will be a matter only of a few weeks after work begins. All the stock has been transferred as a gift to Mr. Frank Hamilton, banker of Austin, who agrees to begin work at once. The roadbed and bridge abutments are the finest in the state, and only await the laying of rails and trestles. Although Mr. Hamilton has, until the latter part of August in which to complete the work, it is sincerely hoped there that the long-talked of enterprise will now be rushed through.

It is reported that the Santa Fe people have begun a survey of a branch road from Ben Franklin to Cooper, and it is believed to be owing to this that President H. H. Kirkpatrick, of the Paris board of trade, on May 5 received a proposition by wire from President Green, of the Texas Midland road, to build his line to Paris for a certain consideration. While it is believed the consideration asked by President Green is too unreasonable to be accepted, a meeting of the board of trade was called for consideration of the matter.

INDUSTRIAL NOTES.

Cars and Locomotives.

—The order for 25 Wilkes patent refrigerator cars for the Philadelphia & Reading Railroad Co. has gone to the Union Car Co., Depew, N. Y.

—The cars which the Haskell & Barker car works at Michigan City are building for the Louisville, New Albany & Chicago, are said to be of superior build. They are all to be 60,000 lbs. capacity. The furniture cars are to be 45 ft. long inside, by 8 ft. 5 in. wide and 9 ft. high from the floor to the under edge of the rafters. The stock cars will be 36 ft. 9 in. long and 9 ft. 2 in. wide over end sills. The flat cars will be 34 ft. long and 8 ft. 8 in. wide over end sills. All the cars will be equipped with Washburn wheels, Williamson steel trucks, New York air brakes, wooden brake beams, Chicago steel complex and Detroit springs. The stock cars and the flats will have American continuous draw-bar attachments, and the furniture cars will be equipped with Dunham doors. The company is also building one 60 ft. postal car, which will be equipped with Pintsch light, Gould's vestibules and Harrison postal fixtures. The car will have six-wheel trucks with Boies wheels 36 in. in diameter.

—The Boyden Brake Co. will supply the air brake equipment of the new locomotives which the Seaboard Air Line is having built at the Pittsburgh Locomotive Works. This equipment includes driver and tender brakes and pneumatic train signal. The Boyden Co. is also furnishing the freight car equipment for the new cars being built by the Seaboard Air Line at its Portsmouth shops.

—The St. Paul & Duluth is reported to have given the Pullman Co. an order for 50 flat cars.

—The Cleveland, Lorain & Wheeling is about to take bids on 350 coal cars.

—The St. Joe Packing Company, St. Joseph, Mo., is reported as wanting 50 refrigerator cars.

—The specifications for the 250 furniture cars to be built for the Chicago Great Western Railway, notice of which was made in our issue of April 11, has been sent to the car builders for bids

—The receivers of the Philladelphia & Reading, in presenting their petition to the United States court, for approval by the court, of the recent orders for equipment, gave the following statement of prices bid for the cars, which included 1,000 coal, 25 refrigerator, 250 gondolas and 250 box cars; 1,000 coal cars, at $575.83 per car ($575,380), delivery July and August, 1896; 25 refrigerator cars, at $892.83 per car ($22,320.75), delivery prior to May 15, 1896; 250 gondola cars, at $475.82 per car ($118,955), delivery prior to Sept. 30, 1896; 250 box cars, at $607.83 per car ($151,957.50), delivery July and August, 1896. Payment for the cars is to be made by an arrangement with J. P. Morgan & Co., who, for a commission of 2½ per cent advance the receivers about 90 per cent of the cost of the equipment, to be secured by a loan thereon, and to be payable in 60 monthly installments, bearing 6 per cent interest.

—The Baldwin Locomotive Works has orders for two large passenger engines for the Chicago, Milwaukee & St. Paul R., which are to be compounds of the latest improved type, capable of maintaining a speed of 75 miles an hour.

—The Rodger Ballast Car Co., of Chicago, has just completed an equipment of 60 ballast cars and one distributing car for the Lake Erie & Western for use on its Northern Ohio Division. These cars are 34 ft. long, of 30 tons capacity, and are fitted with air brakes and M. C. B. automatic couplers. They are built entire of Southern yellow pine and oak and have a running board around the entire top of the hoppers, giving each car a capacity of 25 cu. yds. of ballast. The same company has also completed 100 ballast cars for the Butte, Anaconda & Pacific to be used in hauling the copper ore from the mines at Butte to the reduction works at Anaconda, Mont. This company has been using 250 Rodger ballast cars in this service for the past two years and has adopted them as standard for ore and coal cars.

—Operations were resumed in the car and blacksmith departments of the Carlisle (Pa.) Mfg. Co.'s shops Monday on an order for cars for the Geiser Company, Waynesboro, Pa.

—Thirteen passenger coaches are being built at the Altoona shops of the Pennsylvania, to take the place of those burned in the recent fire in Philadelphia. Orders for more coaches are expected to follow this first order soon.

—The Lehigh Valley R. R. Co. is reported as about to enter the market for 25 new locomotives.

—The distribution of the cars ordered by the Baltimore & Ohio Railroad is as follows: Box cars, Mt. Vernon Car Mfg. Co., 500; Missouri Car & Foundry Co., 500; Barney & Smith Mfg. Co., 800. Coal cars: Missouri Car & Foundry Co., 400; Michigan Peninsular Car Co., 800; South Baltimore Car Works, 1,000; Pullman Car Co., 1,000. The locomotive order has not as yet been given out so far as known.

—The Texas & Pacific road has given an order for 300 box cars to the Mt. Vernon Car Mfg. Co.

Bridges.

—Bids will be received until May 29, at Macon, Ga., by the commissioners of Bibb county, for building an iron bridge across the Ocmulgee river. The bridge will be of two spans of 170 ft. each with two viaducts of 60 ft. each.

—Senator Quay, on April 20, introduced in congress a bill granting the Mifflin Bridge Co., the right to bridge the Monongahela river at McKeesport, Pa.

—The city engineer is preparing plans and estimates for the proposed bridge from Cove street, Boston, to Foundry street and Dorchester avenue, South Boston. The estimated cost is $300,000.

—It is proposed to build four iron bridges at Decatur, Tenn., one of which, it is reported, will be 2,000 ft. long, and is to span the Tennessee river.

—The Baltimore & Lehigh Railroad Co., has let the contract for a steel bridge of 123 ft. span over Deer Creek, at Belair, Md., to the Maryland Steel Co.

—The New York legislature has authorized the City of New York to spend $100,000 for the construction of a bridge over the Harlem river at Spuyten Duyvil Creek and Broadway.

—The bridge over the Mississippi, at Royalton, Minn., which was carried away by high water week before last will be rebuilt immediately.

—A hearing was had on April 21 on the proposed new bridge over the Allegheny river at Freeport, in Pittsburgh. It will have three spans of 320 ft. each, proportioned for double track electric line.

—Mayor Strong has approved the bill providing for a bridge over the tracks of the N. Y., N. H. & H. R. R. between Pellam avenue and Kingsbridge road, New York City.

—The Clinton Bridge & Iron Works, of Clinton, Iowa, has been awarded the contract to build all the iron and wooden bridges in Johnson county, Iowa, during 1896.

—The Youngstown (O.) Bridge Co. has received a contract to construct five steel bridges in Alabama. The company has just made a large consignment of structural iron for a dam on the Kanawha river, West Virginia, being built by the government.

—The Detroit (Mich.) Bridge & Iron Co., has been awarded a contract to construct a bridge at Bay City, Mich., the total length to be 692 ft. and to be of steel.

—The Southern Railway Co. will build at once an iron and steel bridge across the Nerse river, near Selma, N.C., to take the place of the present wooden one.

Bids are asked until May 29 for constructing an iron bridge over the Ocmulgee river at Spring street, Macon, Ga., heretofore referred to. The structure will have two spans of 170 ft. each, with viaduct approaches of 60 ft. each.

—The Eastern Railway of Minnesota has just let a large contract to the Lassig Bridge & Iron Works of Chicago, for the erection of a steel trestle to replace the wooden one upon its entrance into Duluth. This structure will be about 30 ft. in hight and almost a mile in length extending from the Northern Pacific Railroad bridge to the tracks of the St. Paul & Duluth Railroad. This contract calls for a substructure of masonry sufficient to carry a double track trestle, though but a single track will at present be erected. Work has already been commenced upon the foundation, and will be pushed as the contract requires its completion by the middle of August. The work will probably cost $75,000.

—The officials of the Flint & Pere Marquette Railway and the Chicago & Grand Trunk Railway Co. are considering the question of building a viaduct over their tracks at Military road, Port Huron, Mich.

Buildings.

—Division Engineer C. S. Bihler, of the Northern Pacific, has completed the plans and specifications for the buildings for the car shops at Spokane, Wash. The contract for the foundations was let last fall. The contract will call for the completion of the shops by next fall. The building will consist of a 22-stall round house, a machine shop, woodworking shop, blacksmith shop, sand house, oil house, and an office building. They will be constructed of brick and stone.

—The Denver & Rio Grande is to build an addition to the shops at Salida, Col., and remodel portions of the plant. Much new machinery will be put in, and it is expected that when the new improvements are completed the capacity of the shops will be doubled.

—Work has begun upon the new Plant system depot at High Springs, Fla. The building will be 150 x 40 ft. in size, and two stories high. The ground floor will be used as an eating house, ticket office, and general waiting room. The second story will be used for offices.

—The Canadian Pacific Railway and the city government of Montreal have finally settled their differences in regard to the transfers of land between the company and the city, in connection with the construction of the proposed east end station, and the building will now be commenced immediately. The plans for this station were completed in the summer of 1893. The new station will be a very handsome structure about 60 x 300 ft., four stories in hight, and will be connected with the main station of the company in Montreal by an elevated road through the city about two miles long. The architect of the building is Mr. Bruce Price, of New York City.

—The Westinghouse Air Brake Company contemplates putting a roof over the open space between the foundry and blacksmith shop buildings at Wilmerding. This will give it additional foundry room to the extent of 50 x 500 ft., in which it will erect another of its flask carriers, which will increase the output of its foundry from 30 to 40 per cent.

—The Lloyd Booth Co., Youngstown, O., has associated with it Mr. S. V. Huber, a mechanical engineer of large experience. It is the intention of the company to engage more largely than ever in the manufacture of rolling mill, steel works and special machinery. It has purchased the property now occupied by the Fredonia Carriage Co., on South Market street, Youngstown, and expects to put up immediately a new machine and erecting shop. The building will be of steel and brick, 140 ft. long, main span 60 ft. wide, with a two-story lean-to 30 ft. wide by 130 ft. long.

—The San Francisco Chronicle states that the Union Iron Works of that city will erect a new boiler shop 200 x 60 ft. and 60 ft. high. The material will be steel throughout.

—The chief engineers of the Lake Erie & Western and of the Alton together with a representative of the Big Four, recently held a consultation in regard to the construction of a new union passenger station at Bloomington, Ill., or the rebuilding of the present structure, which is wholly inadequate for the business transacted therein.

—The stockholders of the Enterprise Boiler Company, of Youngstown, are considering the question of enlarging the boiler shops and making other improvements.

—The officers of the Boston & Maine state that bids will be received immediately for the new shops at Concord, N. H., which have been talked of for a long time.

—It is announced that the General Electric Company will remove its works from Schenectady, N. Y.; Lynn, Mass., and Harrison, N. J., to some town in New Jersey where the various departments will be consolidated and a complete modern plant will be erected. The location of the new works has not yet been decided on, although it is understood that an offer of valuable land and other privileges at Elizabeth has been made.

—The Pennsylvania Railroad Co. has decided to construct a new freight house on Hotel alley, between Spinning alley and Front street, Cincinnati, O. Supt., Ralph Peters.

—A permit has been granted to the Washburn & Moen Mfg. Co. to rebuild its wire factory recently burned at Worcester, Mass., and build a new addition 248 ft. wide in front, 234 ft. wide in rear, 119 ft. deep and 24 ft. high adjoining its present iron works in Quinsigamond village.

—The formal opening of the new Missouri, Kansas & Texas passenger station at Sedalia, Mo., which was erected at a cost of $35,000, has been postponed to May 10, on account of the interior not being fully completed. On the latter date, the Missouri, Kansas & Texas and Missouri Pacific will sever the joint switching yard and ticket arrangements at this point which have been in force for a number of years.

Iron and Steel.

—The organization of the Cleveland Wheel and Foundry Co. has been perfected by the election of Thomas Maher as president; W. H. Silverthorn, vice president; George W. Short, treasurer, and Jos. A. Stone, secretary. The manufacture of wheels will be carried on more extensively and a specialty will be made of railroad and machinery castings, locomotive drivers and cylinders.

—The Penn Steel Casting & Machine Co. has received an order for 800 tons of steel castings from the Baldwin Locomotive Works. This material is to go into the 60 locomotives being built for the Russian government by that company.

—It is expected that the Peoria Rolling Mill in Avery, Ill., will be in operation shortly. The mill will be enlarged and considerable money spent in improvements.

—An order has been issued by the court to the receiver to arrange with creditors to continue operating the plant of the Carlin Mfg. Co., Pittsburgh.

—The East Chicago Iron and Steel Co., of Hammond, Ind., has been placed in the hands of a receiver. The liabilities are said to amount to $50,000, while the assets will reach $150,000.

—Mr. H. F. J. Porter of Chicago, western representative of the Bethlehem Iron Co., will read a paper on hollow steel forgings at the meeting of the American Society of Mechanical Engineers, to be held in St. Louis, May 19. He has also prepared an article for Cassier's magazine, which will appear shortly and which will treat of steel forgings. Mr. Porter is specially interested in the matter of securing for his company an increase of business among ship and engine builders on the lakes, and he is doing a good deal of missionary work with this end in view. With the aid of a number of lantern slides he will, at an early date, present the subject in an address to Chicago underwriters. He proposes also to make arrangements for similar addresses during the coming winter before the several associations of marine engineers in leading lake cities.

—The Phoenix Iron Works Co., of Cleveland, has just furnished the Chicago Truck and Steel Casting Co., a complete foundry equipment.

—Officials of the Carnegie Steel Co. now make no secret of their connection with the Pittsburgh, Shenango & Lake Erie Railway Co. which controls ore docks and other terminal property at Conneaut. The railway company's alliance with the big steel company will relieve the management of a heavy financial load and result in an entrance to Pittsburgh over the Carnegie belt line. On the other hand the Carnegie Company will have another advantage over competitors in lower handling and carrying charges on its ore from vessel to furnace.

—Vice President Baldwin, of the Southern, is authority for the statement that 20,000 tons of new 75 lb. and 80 lb. steel rails will be laid on the lines of that system this spring.

—The new merchant steel mill of the Illinois Steel Co., at Joliet has been completed and subjected to a satisfactory test, and will run regularly on all usual sizes of flats, rounds and squares.

Machinery and Tools.

—If the machine tool business is to be taken as an example of the tendency of the times, and is generally, then there is every indication that trade is rapidly improving. The Davis & Eagan Machine Tool Co., of Cincinnati, O., state that they are working their full capacity and have orders to keep them going for several months to come. They report that their business for the past month has exceeded that of any one month for several years past, and that there is a good prospect for a steady increase. Machine shops all over the country are putting in more tools in anticipation of a brisk summer and fall trade.

—Mr. Willis Shaw, Chicago, has just shipped a car load of hoisting machinery to Willard & Cornwell, Guthrie, Okla., to be used on their contract with the Santa Fe Railroad. He has also sold the Crystal Glen Rock Crushing Co., Warsaw, Ill., the machinery for its plant, comprising rock drills, dump cars, Pen Argyl hoisting engine, etc.; also a complete rock-crushing plant to Christie & Lowe for the regulating works on the Chicago Drainage Canal at Lockport.

—Maris Bros. Philadelphia, crane builders, have just shipped two three-ton cranes to the New Castle Steel & Tin Plate Co., a three-ton crane to the H. W. Johns Manufacturing Co., Brooklyn; and a five-ton electric hoist to the Pennsylvania Steel Co., Steelton, Pa.

—The Lloyd Booth Co., of Youngstown, has placed with Messrs. Manning, & Moore, New York City, orders for one Shaw patent 30 ton capacity, 60 ft. span electric traveling crane of the three motor type, one 54 inch swing by 400 ft. bed engine lathe, and one 30 inch by 30 inch by 8 ft. planer and with Bement, Miles & Co., Philadelphia, over 122 inch by 122 by 30 ft. planer, which with the modern equipment already installed, will place this company in a position to manufacture the heaviest class of mill machinery. It is also the intention to install a new engine, boiler, generator and electric light plant, so that the new shop can be operated independent of the present machine shop, which will be used exclusiyely for roll turning and erecting. A new air furnace will also be added to the foundry department, and when these improvements are completed the plant will have more than double its present capacity.

—Mr. A. O. Norton, of Boston, manufacturer of the Norton ball bearing jack and "sure drop" track jacks, reports a satisfactory amount of orders for the track jacks. Mr. H. A. Norton, who is at present representing the firm in Mexico, is meeting with good success in introducing the track jacks on Mexican railroads.

Miscellaneous.

—The Union Switch & Signal Co. has removed its office from 620 Atlantic Avenue, Boston, to rooms 1301 and 1302 Havemeyer building, New York City.

—The Northampton Emery Wheel Co., Leeds, Mass., reports a large increase in sales for the year and a favorable outlook for business.

—The Standard Railway Gate Co., of Saginaw, Mich., reports that its standard gate is now in use on over 25 railways, including the following: Pennsylvania Lines, Baltimore & Ohio, Chicago & Grand Trunk, Michigan Central, New York Central & Hudson River, the Atchison, Topeka & Santa Fe, the Southern, the Ohio Central, the Wheeling & Lake Erie, and the Chicago & Eastern Illinois. The gate is also being introduced on other lines.

—The Weeks Automatic Car Coupler Co., of Lamar, Mo., has been incorporated by P. C. Weeks, C. W. Bozarth, H. R. Houston, J. S. Moore and others.

—The Elector Selector & Signal Co., of New York, has moved its offices and workshops to 43 Cortlandt street. It has just completed a new police signal system, which is greatly praised by those who have examined it. The company is still making and installing electric light cutouts, telegraph selectors and other signal devices based upon the selector system, controlled by its patents. Of late it has also made improvements in fire-alarm apparatus. The company announces that it is prepared in its new quarters to undertake all electrical repair work, and will also aid inventors with good men and fine tools in experimental work.

—As is well known, the well-known firm of Queen & Co., manufacturers of scientific instruments, Philadelphia, Pa., were forced some time since to make an assignment. J. G. Gray was selected as assignee and the business was continued under his management as a result of which the business has been turned back to its owners. Every creditor has been paid dollar for dollar. A meeting of the creditors was held in Philadelphia recently, and their sincere thanks extended to Mr. Gray on the gratifying showing he had made, and he was then presented with a handsome set of Encyclopedia Britannica. The appraised assets of the company at the time of the assignment were about $400,000 and the obligations nearly $180,000. Mr. Gray has been connected with James W. Queen & Co. and Queen & Co. since 1882. In the reorganization of the officers of the company Mr. Gray assumes the presidency; S. L. Fox is vice president, and J. M. Hazel, secretary and treasurer.

—The Bond Steel Fence Post Co., of Adrian, Mich., reports recent orders for posts from St. Paul and from points in New Jersey, and that on the whole the outlook for business during this season is very bright.

—A press report states that the large dam at Thorn Brook, above Abbott, Me., was swept away by high water April 20. The dam was about 20 ft. high and one of the most expensive in that section.

—The Pennsylvania Railroad Co. is now treating some 1,200 large bridge timbers, varying in size from 10½ to 25 ft. in length, with woodiline at the especially designed tank at Pavonia, N. J. This emphasizes the fact that the American Wood Preserving Co., Philadelphia, makers of woodiline, have laid considerable stress upon, namely: the adaptability of woodiline, because of its easy application and remarkable penetrative qualities, to work of this nature. This is a large field, apart from the broad one of cross-tie preservation.

—The firm of A. Whitney & Sons, car wheel manufacturers, of Philadelphia, is to be reorganized, but there will be no interruption to the business. Owing to legal complications, there had been issued against the firm an execution for $30,000 and there has been in progress negotiations for a reorganization of the business of the firm by placing it in the hands of a stock company, the capital of which was being subscribed. These arrangements it is expected will be completed, and the execution was merely incident of the reorganization.